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PRELIMINARY ASSESSMENT FOR
49TH AND HAVANA STREET
DENVER, COLORADO
TDD F08-8902-07
005 9637-111

EPA REGIONAL PROJECT OFFICER: VERA MORITZ
E & E PROJECT OFFICER: RON OAK
REPORT PREPARED BY: RONALD OAK
REVIEWED BY: Ken Ford

SUBMITTED TO: LES SPRENGER, FIT-RPO
VERA MORITZ, EPA P.O.

DATE SUBMITTED: MARCH 15, 1989
DATE RESUBMITTED: APRIL 7, 1989

PRELIMINARY ASSESSMENT FOR

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DENVER, COLORADO

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PRELIMINARY ASSESSMENT
FOR THE
49TH AND HAVANA STREET SITE
LOCATED IN THE CITY AND COUNTY OF
DENVER, COLORADO
TDD #F08-8902-07 - PAN #FC00153PAA

The 49th and Havana Street site is located in Township 3 South, Range 67 West, Section 14 in Denver, Colorado (Figure 1). The site is located within an area known locally as the Montbello Industrial Park. This is an approximate 360 acre area characterized by warehouses, offices, commercial and light industrial facilities less than 20 years old. The study area is bounded on the north by 49th Avenue, on the south by 47th Avenue, on the west by Havana Street and on the east by Ironton Street. The operations of concern in the area include light industrial operations located primarily at the southern end of the study area.

This site was identified initially from sampling performed as part of the enforcement activities in the North Smith Road area (TDD #F08-8809-21). Immediately west of the 49th and Havana Street site on Stapleton Airport property, the FIT drilled 12 five foot deep soil boreholes. Subsurface soil samples taken from the five foot to six foot depth were analyzed for volatile organics using both FASP and CLP procedures. FASP analysis was performed during the sampling project and entailed portable gas chromatographic analysis of the soil samples' head space. FASP analysis revealed concentrations of 1,1,1-trichloroethane (TCA at 1059 ppb), and lesser concentrations of tetrachloroethylene (PCE) and trichloroethylene (TCE) in the subsurface soil. CLP analysis of split spoon samples also taken at these locations revealed concentrations of chloroform and tentatively identified 1,2-dichloroethane (DCA) and TCA. CLP analysis did not confirm the presence of TCE or PCE detected by FASP. This may be due to the enhanced sensitivity of the FASP methods.

Observation of area well water depths and information from other FIT investigations in the vicinity indicates ground water flow is in a northwesterly direction. Since the 49th and Havana Street site is located immediately east of the sampled borehole area, it is thought that the 49th and Havana Street site may be the source of the observed contamination.

A FIT windshield survey conducted on February 17, 1989 revealed very little apparent industrial activity in the area of the site. Facilities in the northern portion of the block are primarily offices and a few warehouses. No evidence of likely chemical storage or use was noted. In the southern portion of the block only one facility, Scotts Liquid Gold, appeared to store large quantities of chemicals onsite. One facility adjacent to Scotts, Baron Industries, is a small plastics processing facility which conducts plastic molding and extruding activities. Such a facility, in various finishing processes, may utilize small quantities of chlorinated hydrocarbon solvents. No bulk storage of chemicals appeared obvious at this facility. Furthermore, Baron Industries does not appear on the EPA RCRA notifiers listings and the Colorado Department of Health (CDH) has no record of a site inspection of this facility.

Prior to development of the Montbello area, aerial photographs taken in 1948 reveal an excavated depression near the current site occupied by the Scotts Liquid Gold facility. The depression appeared to be approximately eight feet deep with a radial pattern emanating from it. It is not known exactly what significance this depression may have on the current site, but it may have been connected with the extensive fill activities observed occurring at the same time along Sand Creek to the south. Vegetation in the area of the depression did not appear stressed. Subsequent aerial photos taken in 1963 fail to reveal any commercial development within the Montbello area and the depression noted in 1948 was not present.

Scotts Liquid Gold, Inc. lies directly east of the FIT soil borehole survey area. Scotts operates a facility here which

manufactures commercial chemical products. According to a FIT review of RCRA records kept by CDH on November 17, 1988, process chemicals stored and used at the facility include: TCA, naphtha, process oils and SDA 40 alcohol. The exact identity of SDA 40 alcohol is not known but underground tank records indicate it may be ethanol. The chemicals used are held in bulk storage tanks, some of which are underground.

According to a FIT review of CDH files, the Scotts facility has 12 registered underground tanks. CDH considers a tank to be underground when at least 10 percent of the tank or tank piping systems are located underground. CDH files also list the reported chemical contents and tank storage capacities of all registered underground tanks at the Scotts facility and these are indicated below.

<u>Number of Tanks</u>	<u>Contents</u>	<u>Total Storage Capacity (gals)</u>
1	TCA	30,000
3	Naphtha	50,000
2	Ethanol	16,000
1	Gasoline	2,000
2	Process Oil	60,000
2	empty or out of service	36,000

(One tank was not recorded properly and its contents are unknown)

CDH files also revealed the following information. Past complaints from the public alleged illegal onsite storage of hazardous waste and a possible occurrence of a large TCA release from underground tanks. Scotts currently does not have RCRA interim permit status or a Part B permit which would allow it to store hazardous waste onsite. Approximately two to three drums of process waste is generated by the facility each month. This material is shipped offsite within 30 days. Two waste tanks were used prior to July, 1986 for containment purposes but these were reportedly pumped dry and taken out of service.

Scotts has undergone a number of inspections by CDH in 1982, 1984 and 1987. According to these inspections, weekly tank measurements obtained by the company do not indicate any abnormal decreases in liquid storage values. However, the company has contracted a consultant to evaluate the possibility of an underground storage tank leak.

During a CDH inspection of the company on April 15, 1987 a review of company invoices and hazardous waste manifests indicate a transfer of waste from the Scotts facility to a number of sites. The majority of transferred wastes included flammable liquid wastes. Company manifests list one occasion on April 28, 1986 where there was a documented shipment of corrosive liquids (acids and bases) and a liquid poison. These items were later returned to the facility and records fail to show any further shipment of them. An onsite drum yard inspection by CDH on April 15, 1987 revealed drums containing vacuum pump oil, Freon TMS, thinner plus solvent and arsenic-contaminated drums. During the CDH inspection, eight drums with Foothills Auto Salvage markings were noted onsite. The presence of these drums at the facility could not be explained through manifests or invoices reviewed during the inspection. During a CDH inspection on March 17, 1986 of the Foothills Auto Salvage facility located in Broomfield, Colorado, similar drums were found to contain: TCA, chloroform, perchloroethylene, benzene, xylenes and tetrahydrofuran. It remains a possibility that such compounds may be stored on Scotts property. During the writing of this PA the FIT attempted to contact company officials concerning general facility operations and waste storage practices. Company officials were, however, repeatedly unavailable for comment.

An extensive ground water investigation of the Scotts Liquid Gold facility was undertaken by a company consultant, Harding-Lawson Associates. Although the actual dates of environmental sampling (surface soil, subsurface soil and ground water) were not specified in the investigation report, this report was submitted to CDH on October 27, 1988 and a copy of this report is included in this preliminary assessment in Appendix B. This report was not available during the initial review of CDH files.

Nine monitoring wells were installed and sampled upgradient and downgradient from two underground tank farms present at the facility. General conclusions listed in the report indicate that the tank farms may be a source of some of the chemical constituents found in the soil and ground water under the site and that an inadvertent loss of tank materials may have occurred.

The highest levels of contaminants detected during the investigation in ground water under the site at both the upgradient and downgradient well locations are given below.

<u>Compound</u>	<u>Highest Detected Level (ppb)</u>	
	<u>Upgradient</u>	<u>Downgradient</u>
TCA	6.1	13,000
DCE	ND	1,100
T-DCE	35	20
DCA	ND	180
TCE	36	46
VM&P Naphtha	ND	260
Corvus oil	ND	200

ND - not detected

In addition to the above compounds, trace levels of carbon disulfide, chloroform, 1,2-DCA, 2-hexanone, PCE and chlorobenzene were also detected.

The study also revealed in the surface and subsurface soil samples, levels of DCE, TCA TCE, toluene, ethylbenzene, xylenes, VM&P naphtha and Corvus oil.

The principal route of concern for the 49th and Havana Street site is the ground water pathway. Organic contamination has been documented in the shallow alluvial aquifer within one mile downgradient of the site at one Stapleton Airport well (DC-GW-1) and also at one U.S. Army well (#090013) on February 17, 1986. Ground water contamination also has

been documented at one facility in the study area, Scotts Liquid Gold, Inc. (Appendix B).

Hazard Ranking System (HRS) criteria require the documentation of ground water use within a three mile radius of any evaluated site. For this reason the following information is provided. Approximately three miles northwest of the site at 64th and Quebec, a South Adams County Water and Sanitation District (SACWSD) production well (SAC-14) provides water to an estimated 30,000 domestic users. Within the three mile radius of the site, 168 domestic wells serve an additional 5,000 estimated users, the majority of which reside in a trailer park approximately one mile southeast of the site. Although a storm sewer is located adjacent to the site and connects with Sand Creek approximately one mile south of the site, there are no surface water diversions or recreational use of these waters within three miles. No information could be located which would indicate a possible airborne release of contamination from this site.

REFERENCES

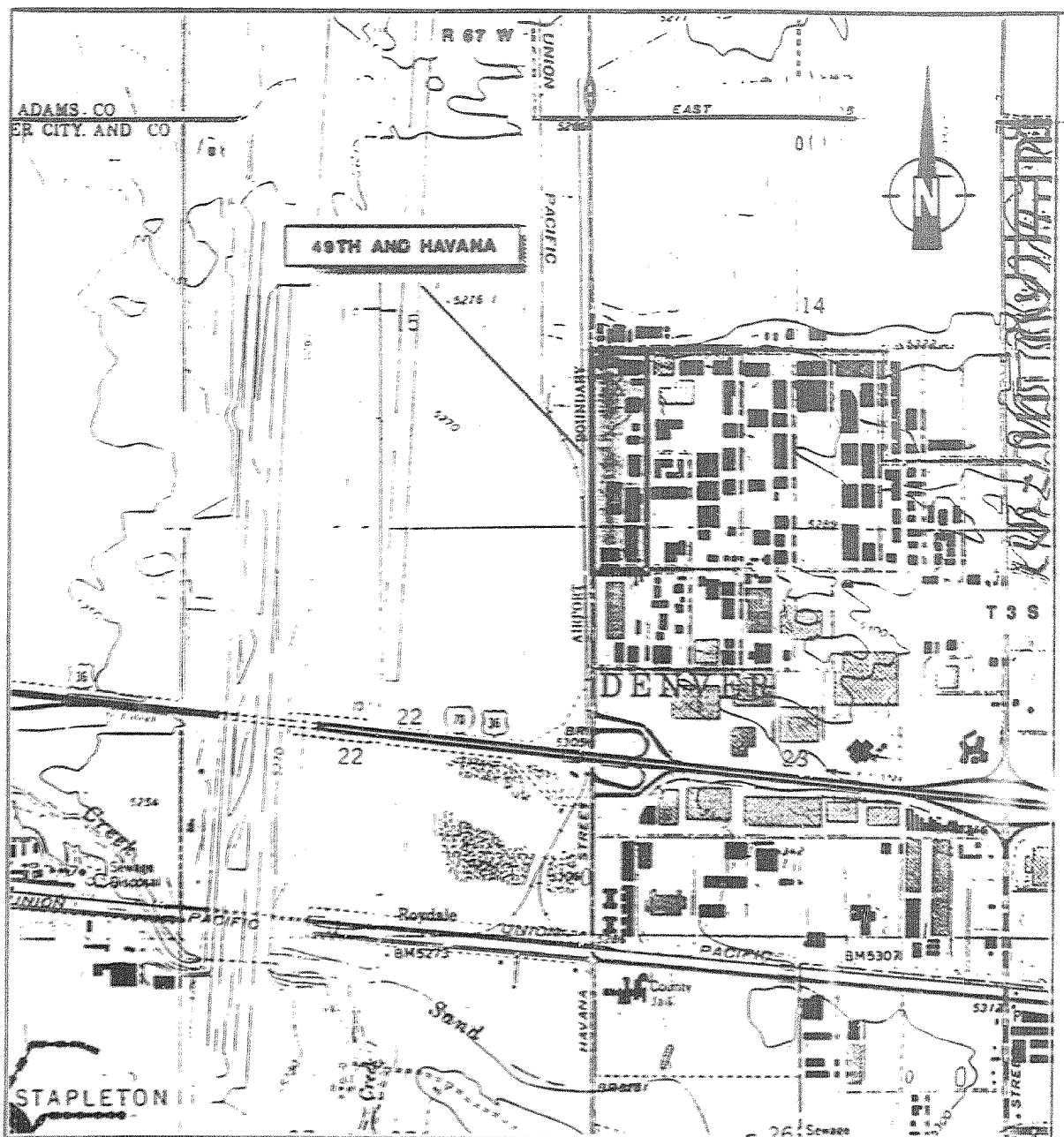
Personal Communication with Nancy Jackson, Colorado Department of Health,
Hazardous Materials and Waste Management Division on 3/29/89.

Personal Communication with Scott Perat, Colorado Department of Health,
Hazardous Materials and Waste Management Division on 3/07/89.

Harding-Lawson Associates Phase I Report. Ground Water Site Investigation,
Scott's Liquid Gold, Denver, Colorado. 10/26/88.

USGS Topographic Map. Sable Quadrangle, Colorado, 1979.

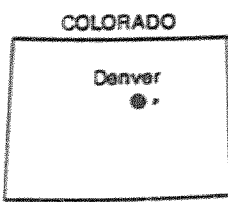
Enforcement Activities Report, North Smith Road Area, Denver, Colorado
(TDD F08-8809-21). Prepared by R. Perlis 2/02/89.



Source: Sable Quadrangle, Colorado. USGS, 1979



LOCATION MAP



LEGEND

 Site location

FIELD INVESTIGATIONS OF UNCONTROLLED
HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

TITLE:
49TH AND HAVANA
Denver, Colorado
SITE LOCATION MAP

T.O.D. F08-8902-07

ecology & environment, inc.
DENVER, COLORADO

FIG. 1

Date: 03/89 Drawn by: RSM Scale:

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT						I. IDENTIFICATION	
EPA						01 STATE CO	02 SITE NUMBER -
PART 1 - SITE INFORMATION AND ASSESSMENT							
II. SITE NAME AND LOCATION							
01 SITE NAME (Legal, common, or descriptive name of site) 49TH AND HAVANA				02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER T3S,R67W,SECT.14			
03 CITY DENVER		04 STATE CO	05 ZIP CODE 80239	06 COUNTY DENVER	07 COUNTY CODE 031	08 CONG DIST 01	
09 COORDINATES LATITUDE 39°47'10.0"		LONGITUDE 104°51'05.0"					
10 DIRECTIONS TO SITE (Starting from nearest public road) SITE IS LOCATED IN THE MONTEBELLO INDUSTRIAL PARK IN AN AREA BOUNDED ON THE NORTH BY 49TH AVE., ON THE WEST BY HAVANA ST., ON THE SOUTH BY 47TH AVE. AND ON THE EAST BY IROXTON ST.							
III. RESPONSIBLE PARTIES							
01 OWNER (If known) ONE FACILITY: SCOTT'S LIQUID GOLD, INC.				02 STREET (Business, mailing, residential) 4880 HAVANA ST.			
03 CITY DENVER		04 STATE CO	05 ZIP CODE 80239	06 TELEPHONE NUMBER (303)373-4860			
07 OPERATOR (If known and different from owner) SAME				08 STREET (Business, mailing, residential)			
09 CITY		10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER			
13 TYPE OF OWNERSHIP (Check one) ___ A. PRIVATE ___ B. FEDERAL: _____ C. STATE ___ D. COUNTY ___ E. MUNICIPAL (Agency name) ___ F. OTHER: MIXED OWNERSHIP, COMMERCIAL & INDUSTRIAL G. UNKNOWN (Specify)							
14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply) X A. RCRA 3001 DATE RECEIVED: 05/22/81 ___ B. UNCONTROLLED WASTE SITE (RCRA 103 c) DATE RECEIVED: _____ C. NONE MO/DAY/YR MO/DAY/YR							
IV. CHARACTERIZATION OF POTENTIAL HAZARD							
01 ON SITE INSPECTION ___ X YES DATE 04/15/87 ___ NO MO/DAY/YR				BY(Check all that apply) ___ A. EPA ___ B. EPA CONTRACTOR ___ X C. STATE ___ D. OTHER CONTRACTOR ___ E. LOCAL HEALTH OFFICIAL ___ F. OTHER: (Specify) CONTRACTOR NAME(S): _____			
02 SITE STATUS (CHECK ONE) ___ A. ACTIVE ___ B. INACTIVE ___ X C. UNKNOWN				03 YEARS OF OPERATION BEGINNING YEAR ENDING YEAR ___ X UNKNOWN			
04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED SUBSURFACE SOIL SURVEYS CONDUCTED BY PIT UNDER TDD#F08-8809-21 INDICATED TCA, TCE, PCE, DCE AND CHLOROFORM CONTAMINATION IN AN AREA IMMEDIATELY DOWNGRADIENT FROM THIS SITE. A GROUND WATER STUDY CONDUCTED BY A PRIVATE CONSULTANT AT ONE FACILITY (SCOTT'S) INDICATED ELEVATED GROUND WATER LEVELS OF TCA, DCA AND DCE.							
05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION THE PRINCIPAL PATHWAY OF CONCERN IS VIA THE GROUNDWATER ROUTE. A STORM DRAIN ADJACENT TO THE SITE FEEDS INTO SAND CREEK APPROX. 1 MILE SOUTH OF THE SITE. HOWEVER, NO SURFACEWATER DIVERSIONS EXIST WITHIN 3 MILES OF THE SITE. NO INDICATION OF A POTENTIAL AIRBORNE RELEASE IS EVIDENT.							
V. PRIORITY ASSESSMENT							
01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous conditions and incidents) ___ A. HIGH ___ X B. MEDIUM ___ C. Low ___ D. NONE (Inspection required promptly) (Inspection required) (Inspect on time available basis) (No further action needed. Complete current disposition form)							
VI. INFORMATION AVAILABLE FROM							
01 CONTACT VERA MORITZ		02 OF (Agency/Organization) U.S.EPA			03 TELEPHONE NUMBER (303)293-1536		
04 PERSON RESPONSIBLE FOR ASSESSMENT RONALD OAK		05 AGENCY EPA	06 ORGANIZATION E & E ,INC.	07 TELEPHONE NUMBER 303-757-4984	08 DATE 03/31/89 MO/DAY/YR		

EPA FORM 2070-12 (7-81)

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT		I. IDENTIFICATION	
EPA	PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS	01 STATE CO	02 SITE NUMBER -
II. HAZARDOUS CONDITIONS AND INCIDENTS			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u>X</u> A. GROUND WATER CONTAMINATION</p> <p>03 POPULATION POTENTIALLY AFFECTED: <u>35,000</u></p> </div> <div style="width: 50%;"> <p>02 <u>X</u> OBSERVED (DATE: <u>2/17/86</u>) <u> </u> POTENTIAL <u>X</u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>ORGANIC CONTAMINATION OF THE SHALLOW GROUNDWATER AQUIFER HAS BEEN DOCUMENTED IN THE AREA WEST OF THE SITE AT STAPLETON AIRPORT WELL DC-GW-1 AND U.S. ARMY WELL #090013. ORGANIC CONTAMINATION ALSO HAS BEEN DOCUMENTED IN GROUND WATER AT THE SCOTTS FACILITY.</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u>X</u> B. SURFACE WATER CONTAMINATION</p> <p>03 POPULATION POTENTIALLY AFFECTED: <u>NONE</u></p> </div> <div style="width: 50%;"> <p>02 <u> </u> OBSERVED (DATE: <u> </u>) <u>X</u> POTENTIAL <u> </u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>NONE REPORTED OR OBSERVED. HOWEVER, IT IS POSSIBLE CONTAMINATED GROUNDWATER MAY BE CONTRIBUTING TO SURFACEWATER FLOW IN SAND CREEK, APPROXIMATELY 1 MILE SOUTH OF THE SITE.</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u> </u> C. CONTAMINATION OF AIR</p> <p>03 POPULATION POTENTIALLY AFFECTED: <u> </u></p> </div> <div style="width: 50%;"> <p>02 <u> </u> OBSERVED (DATE: <u> </u>) <u> </u> POTENTIAL <u> </u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>NONE REPORTED OR OBSERVED</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u> </u> D. FIRE/EXPLOSIVE CONDITIONS</p> <p>03 POPULATION POTENTIALLY AFFECTED: <u> </u></p> </div> <div style="width: 50%;"> <p>02 <u> </u> OBSERVED (DATE: <u> </u>) <u> </u> POTENTIAL <u> </u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>NONE REPORTED OR OBSERVED</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u> </u> E. DIRECT CONTACT</p> <p>03 POPULATION POTENTIALLY AFFECTED: <u> </u></p> </div> <div style="width: 50%;"> <p>02 <u> </u> OBSERVED (DATE: <u> </u>) <u> </u> POTENTIAL <u> </u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>NONE REPORTED OR OBSERVED</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u>X</u> F. CONTAMINATION OF SOIL</p> <p>03 AREA POTENTIALLY AFFECTED: <u>ONE</u> (Acres)</p> </div> <div style="width: 50%;"> <p>02 <u>X</u> OBSERVED (DATE: <u>1988</u>) <u> </u> POTENTIAL <u>X</u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>SUBSURFACE SOIL SAMPLES TAKEN IMMEDIATELY DOWNGRADIENT OF THE SITE AND ALSO ON THE SCOTTS PROPERTY HAVE BEEN DOCUMENTED AS CONTAINING ORGANIC CONTAMINATION.</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u>X</u> G. DRINKING WATER CONTAMINATION</p> <p>03 POPULATION POTENTIALLY AFFECTED: <u>35,000</u></p> </div> <div style="width: 50%;"> <p>02 <u>X</u> OBSERVED (DATE: <u>1986</u>) <u>X</u> POTENTIAL <u> </u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>CONTAMINATION OF DRINKING WATER IN THE SOUTH ADAMS COUNTY AREA HAS BEEN EXTENSIVELY DOCUMENTED. POPULATION ESTIMATE INCLUDES SACRED USERS AND DOMESTIC WELL USERS. THE OBSERVED DRINKING WATER CONTAMINATION IS NOT YET ATTRIBUTABLE TO THIS SITE.</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u> </u> H. WORKER EXPOSURE/INJURY</p> <p>03 WORKERS POTENTIALLY AFFECTED: <u> </u></p> </div> <div style="width: 50%;"> <p>02 <u> </u> OBSERVED (DATE: <u> </u>) <u> </u> POTENTIAL <u> </u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>NONE REPORTED OR OBSERVED</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>01 <u> </u> I. POPULATION EXPOSURE/INJURY</p> <p>03 POPULATION POTENTIALLY AFFECTED: <u> </u></p> </div> <div style="width: 50%;"> <p>02 <u> </u> OBSERVED (DATE: <u> </u>) <u> </u> POTENTIAL <u> </u> ALLEGED</p> <p>04 NARRATIVE DESCRIPTION</p> <p>NONE REPORTED OR OBSERVED</p> </div> </div>			

APPENDIX A
PHOTO LOG

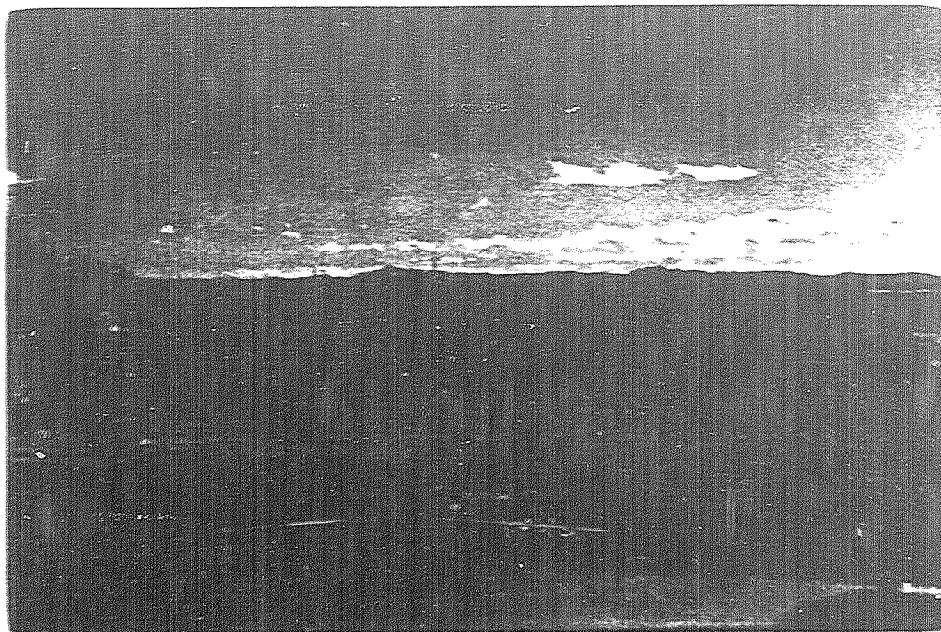


PHOTO 1: STORM DRAIN ADJACENT TO THE SITE LOOKING SOUTH. AREA INSIDE THE FENCE ON THE RIGHT IS WHERE THE STAPLETON SOIL CARDS SURVEY WAS ACCOMPLISHED.



PHOTO 2: AREA IMMEDIATELY NORTH OF THE SITE LOOKING SOUTH ALONG THE ROAD CORNER.

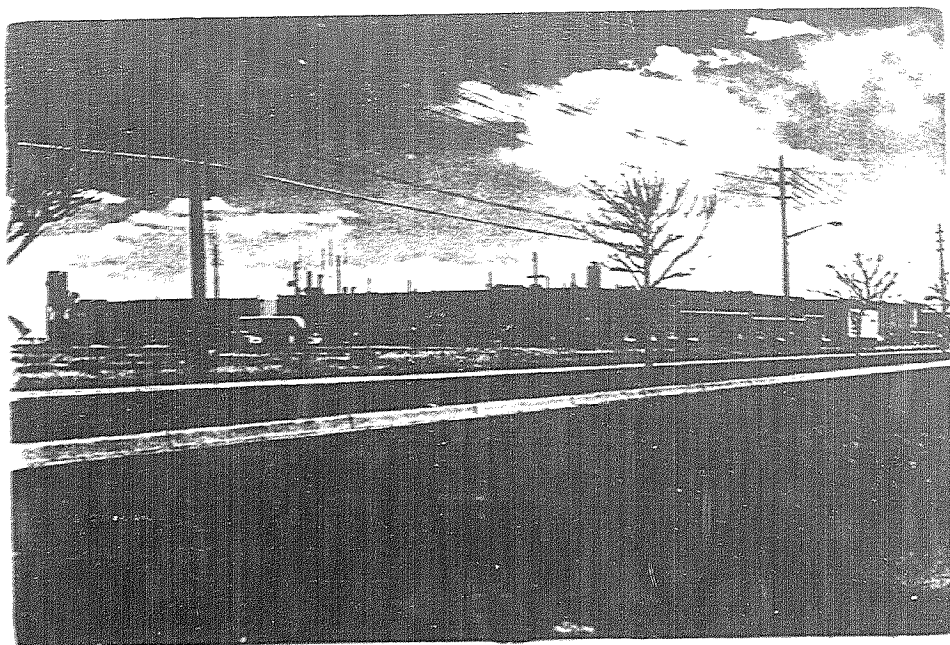


PHOTO 3: NORTHERN VIEW OF THE SCOTTS FACILITY ALONG HAVANA STREET.

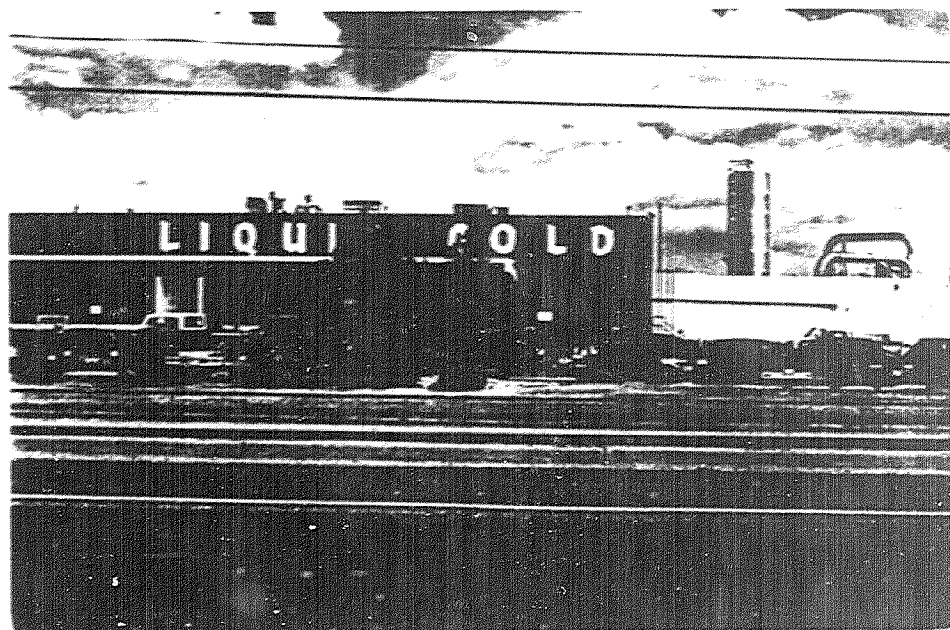


PHOTO 4: FRONT VIEW OF SCOTTS FACILITY. STAPLETON SOIL VAPOR SURVEY AREA IS IMMEDIATELY ACROSS FROM THIS VIEW.

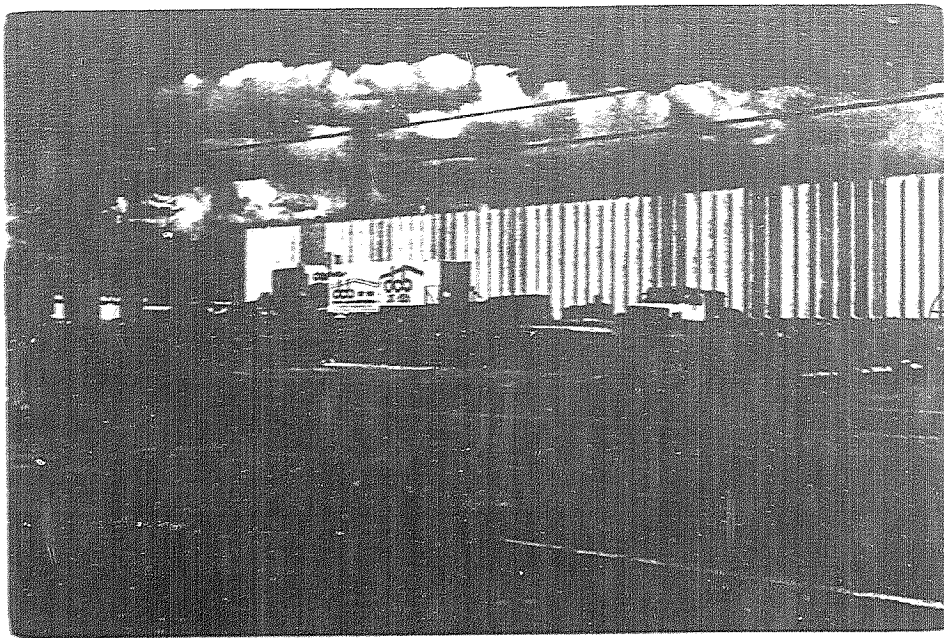


PHOTO 5: NEW ADDITION TO SCOTTS IMMEDIATELY SOUTH OF THE PRESENT FACILITY.

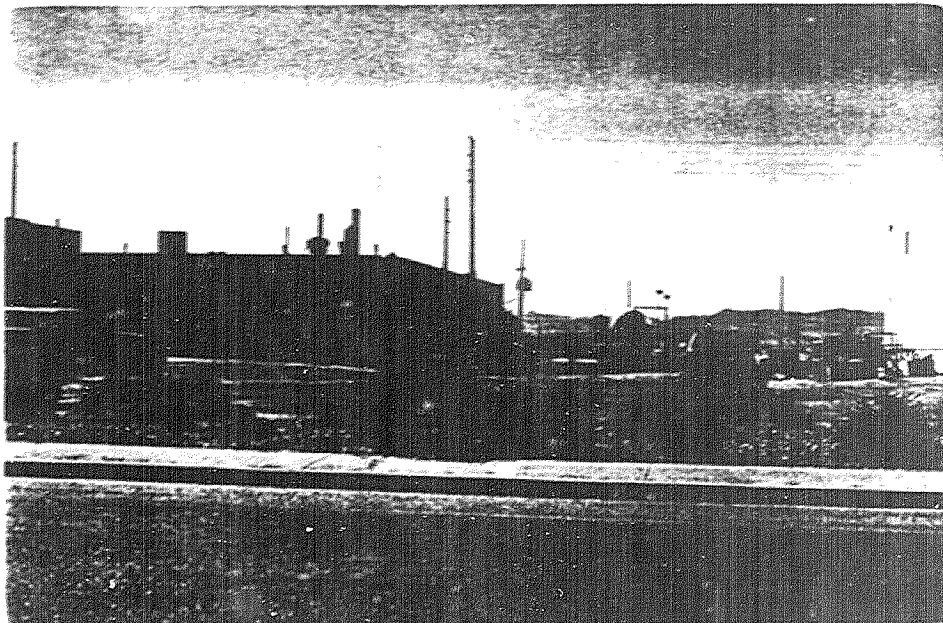


PHOTO 6: WIDE VIEW OF SCOTTS FACILITY.

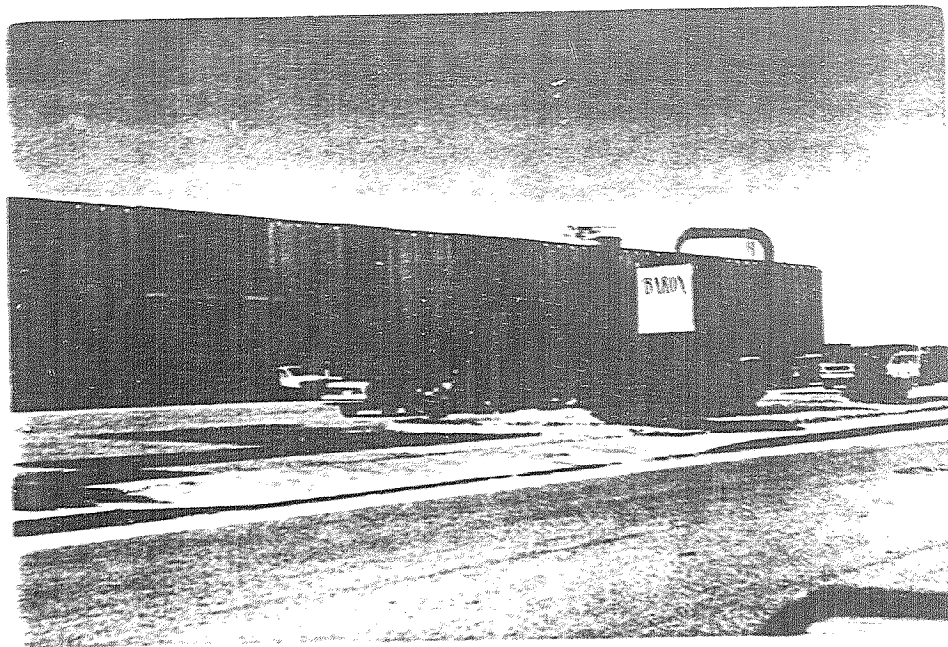


PHOTO 7: PARON INDUSTRIES PLASTICS MOLDING FACILITY.

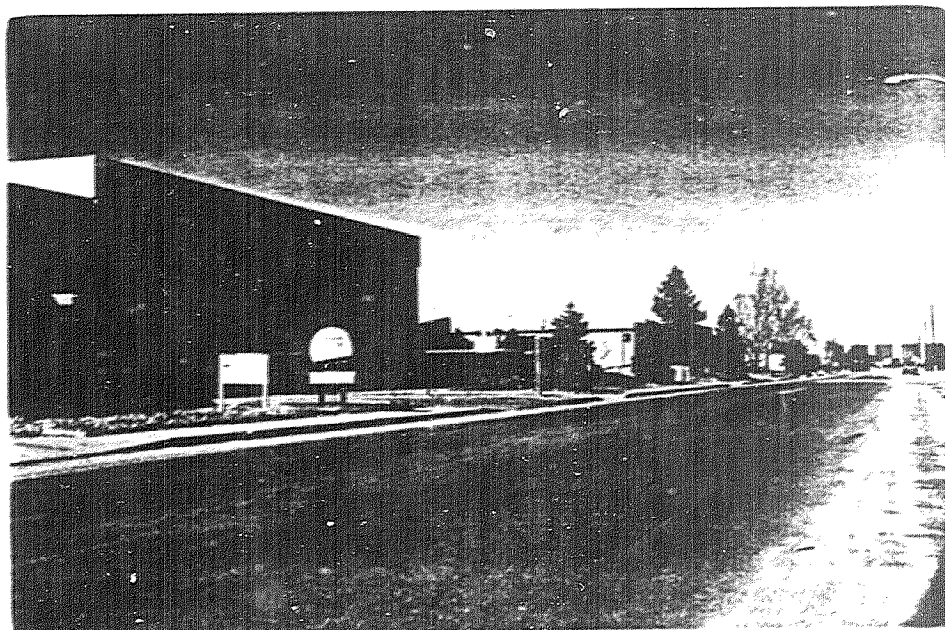


PHOTO 8: FACILITIES IMMEDIATELY NORTH OF THE SCOTT'S FACILITY ALONG DIXON STREET.

APPENDIX B

PHASE I REPORT; GROUND WATER SITE INVESTIGATION

SCOTT'S LIQUID GOLD, DENVER, COLORADO

PREPARED BY: HARDING LAWSON ASSOCIATES

PARCEL, MAURO, HULTIN & SPAANSTRA

ATTORNEYS AT LAW
SUITE 3600

1801 CALIFORNIA STREET

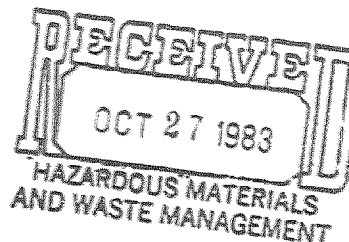
DENVER, COLORADO 80202

TELEPHONE (303) 292-8400

TELECOPIER (303) 295-3040

ROBERT W. LAWRENCE

October 27, 1988



Ms. Joan Sowinski
Section Chief
Colorado Department of Health
Hazardous Materials & Waste
Management Division
4210 East 11th Avenue - Room 351
Denver, Colorado 80220

Dear Joan:

Enclosed please find two copies of the "Phase I Report, Groundwater Site Investigation, Scott's Liquid Gold, Denver, Colorado" prepared by Harding-Lawson Associates. The report has gone through recent revisions; we appreciate your patience in awaiting this report.

We look forward to meeting with you once you have had an opportunity to review the report. Please do not hesitate to call if you have any questions or concerns.

Sincerely,

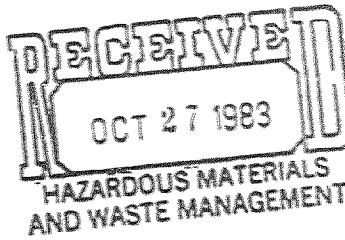
Robert W. Lawrence
Robert W. Lawrence
James R. Spaanstra

RWL:JRS:rcp
enclosures

Harding Lawson Associates

A Report Prepared for

Parcel, Mauro, Hultin & Spaanstra
Attorneys at Law
1801 California Street, Suite 3600
Denver, Colorado 80202



PHASE I REPORT
GROUND-WATER SITE INVESTIGATION
SCOTT'S LIQUID GOLD
DENVER, COLORADO

HLA Job No. 18696,00110

by

Kevin J. Mathews
Kevin J. Mathews,
Hydrogeologist

Michael J. Matley
Michael J. Matley,
Senior Geochemist

Daniel A. Balbiani
Daniel A. Balbiani, P.E.,
Managing Associate Engineer

Harding Lawson Associates
1301 Pennsylvania Street, Suite 200
Denver, Colorado 80203

October 26, 1988

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1.0 INTRODUCTION

This report presents the results of Phase I of a Ground-Water Site Investigation conducted by Harding Lawson Associates (HLA) at the Scott's Liquid Gold (SLG) facility in Denver, Colorado. The Ground-Water Site Investigation was performed under the direction and control of Parcel, Mauro, Hultin & Spaanstra (PMHS) at the request of SLG. This Phase I Report was prepared in accordance with the requirements set forth in HLA's proposal.

The purpose of the investigation was to develop sufficient information to (1) assess the integrity of 12 underground storage tanks, (2) assess the type and extent of chemical constituents associated with areas of ground staining in the railroad spur area and vapor recovery system, and (3) evaluate the nature, extent, and sources, if any, of chemical constituents in ground-water beneath the SLG facility.

In order to achieve these objectives, the investigation was divided into a two-phase field program. The results of the Phase I investigation were used to design the Phase II investigation. This report discusses the findings of the Phase I field program.

1.1 FACILITY BACKGROUND

The SLG facility is located at 4880 Havana Street in Denver, Colorado. The facility is situated on a 6.6-acre parcel; the southern 3 acres are currently undeveloped (see Figure 1). The SLG facility was initially constructed in 1970 and consisted of approximately 4,200 square feet of office space and 21,650 square feet of warehouse. The facility was expanded in 1972 to its present size of approximately 12,400 square feet of office space and

63,000 square feet of warehouse space. The majority of the area not occupied by buildings is covered by asphalt pavement. Two small areas adjacent to the offices and Havana Street are landscaped.

SLG manufactures and packages a wood preservative and aerosol air fresheners. Manufacturing operations have been ongoing at this location for the past 18 years. SLG stores raw manufacturing materials in 11 underground storage tanks (USTs) at the site and maintains an underground gasoline tank for fueling company vehicles. A railroad spur along the eastern property boundary is utilized for bulk delivery of manufacturing materials and shipment of finished products (see Figure 1).

The 11 manufacturing material USTs are grouped into two tank farms near the northwest and southeast corners of the facility building (see Figure 1). The gasoline UST is located at the southeast corner of the facility. Table 1 provides a summary of the tank dimensions, capacity, construction material, age, and historical use for all 12 USTs at the facility.

The facility operates a vapor recovery system in connection with a product filling line. The recovery system collects vapor during filling operations and routes the vapor via a metal pipe to the roof, east across the roof, and down the east building wall, where the pipe terminates outside the building into a 20-gallon sealed collection container.

1.2 PHASE I INVESTIGATIVE APPROACH

Phase I of the investigation was subdivided into two segments, Phase Ia and Phase Ib. The purpose of the Phase Ia investigation was to assess the integrity of the 12 USTs (i.e., assess whether the tanks were leaking) at the facility and to evaluate the nature and extent of chemical constituents in

Table 1. Underground Storage Tank Summary

Harding Lawson Associates

<u>Tank No.</u>	<u>Diameter (feet)</u>	<u>Length (feet)</u>	<u>Capacity (gallons)</u>	<u>Construction Material</u>	<u>Age (years)</u>	<u>Historical Use</u>
ST-1	8.0	27	10,000	carbon steel	18	Stored Corvus oil from 1970 through 1977. From 1978 to present stored isopar naphtha.
ST-2	8.0	27	10,000	carbon steel	18	Stored Corvus oil from 1970 through 1977. From 1978 to present stored isopar naphtha.
ST-3	8.0	27	8,000	carbon steel	18	Stored VM&P naphtha from 1970 to 1982. Stored anhydrous alcohol from 1982 to present.
ST-4	8.0	27	8,000	carbon steel	18	Stored 1,1,1-trichloroethane from 1970 to 1982. Stored anhydrous alcohol from 1982 to present.
ST-5	8.0	27	6,000	carbon steel	18	Stored nitrobenzene from 1970 to 1975. Stored off-specification chemicals from 1975 to June 1986. Has been empty since June 1986.
ST-6A	11.0	42	30,000	carbon steel	16	Stored Corvus oil from 1972 to present.
ST-6B	11.0	42	30,000	carbon steel	16	Stored Corvus oil from 1972 to present.
ST-6C	11.0	42	30,000	carbon steel	16	Stored Corvus oil from 1972 to present.
ST-7	11.0	42	30,000	carbon steel	16	Stored VM&P naphtha from 1972 to present.
ST-8	11.0	42	30,000	carbon steel	16	Stored 1,1,1-trichloroethane from 1972 to present.
ST-9	10.0	17	10,000	carbon steel	16	Stored nitrobenzene from 1972 to 1975. Stored off-specification Liquid Gold from 1975 to June 1986. Has been empty since June 1986.
Gasoline	5.4	12	2,000	carbon steel	16	Stored leaded and unleaded gasoline from 1972 to present.

soil associated with a ground stain in the railroad spur bulk delivery area.

The scope of the Phase Ia investigation consisted of the following activities:

- Conduct a tank tightness test on the gasoline UST.
- Conduct a soil sampling and analysis program consisting of nine soil samples obtained from one soil boring and six borings converted to monitoring wells.
- Conduct a ground-water sampling and analysis program by obtaining samples from six monitoring wells.
- Estimate preliminary ground-water flow direction beneath the site by measuring water levels in the six monitoring wells and surveying the location and elevation of each monitoring well.

The purpose of the Phase Ib investigation was to (1) collect additional water-level information to further delineate ground-water flow direction beneath the site, (2) confirm the preliminary Phase Ia ground-water analytical results, (3) evaluate whether chemical constituents originating offsite (i.e., from other industrial facilities) are migrating via the ground-water flow system under SLG's property, and (4) investigate a soil stain near the vapor recovery system collection container. In order to obtain the information necessary to achieve these objectives, the following scope of work was performed:

- Three additional ground-water monitoring wells were installed adjacent to the eastern property boundary. The location and elevation of each monitoring well was surveyed.
- One soil boring was drilled in the soil stain near the vapor recovery system collection container, and four soil samples were obtained for chemical analysis.
- Water levels were measured in the three Phase Ib monitoring wells and the six Phase Ia monitoring wells.

- Ground-water samples were obtained from the six Phase Ia monitoring wells and the three Phase Ib monitoring wells and were submitted for chemical analysis.

A detailed discussion of the Phase I field investigation program is presented in Section 2.0 of this report. Section 3.0 provides a discussion of the Phase I results, and Section 4.0 presents HLA's conclusions.

2.0 PHASE I FIELD INVESTIGATION

Activities conducted during the Phase I field investigation were designed to provide the information necessary to assess the integrity of the 12 USTs and to evaluate the nature and extent of chemical constituents in soil and ground water at the SLG facility. The field investigation was divided into three general tasks: (1) tank tightness testing, (2) soil investigation, and (3) ground-water investigation. Details of each of these investigations are provided in later subsections.

The most direct method of assessing the integrity of USTs is the tank tightness test (TTT), and this method was used to assess the gasoline UST. The TTT was determined to be inappropriate for the other SLG tanks for the following reasons:

1. In order to perform the test, the tank must be filled completely with the material stored. It would have been prohibitively expensive to purchase sufficient material to completely fill the tanks with Corvus oil and TCA.
2. Several raw manufacturing materials stored in the SLG USTs are not compatible with the TTT equipment (e.g., TCA) and would cause damage during the testing process, thereby invalidating the test results.
3. Based on the size of the tanks at SLG, the tests would require up to three access ports at least three inches in diameter. The majority of the tanks have only one or two access ports, and only one of the ports is accessible at ground surface. The remaining one to two ports are accessible only at the top of the tank, which is four to five feet below ground surface.
4. The tanks are 16 to 18 years old. The TTT method induces a slight hydrostatic pressure that may alter the present integrity of the tank.

The integrity of the remaining 11 manufacturing material USTs was assessed based on the results of the soil and ground-water investigations.

2.1 TANK TIGHTNESS TEST

The integrity of the gasoline UST was assessed by using the TTT. The TTT was conducted by Western States Tank Testing (WSTT) of Denver, Colorado, a company specializing in underground tank testing, using the Petro-Tite Tank Testing System. This test system is essentially a fluid static (standpipe) test that measures changes in tank volume over time to an accuracy of 0.001 gallons per hour. Volume changes can be attributed to variations in temperature, pressure, tank end deflection, or leakage. Equilibration of temperature is provided by circulating the fluid contents with a pump prior to and during the test and constantly measuring the temperature with a thermistor. Any temperature fluctuations detected during the test are thereby considered applicable to the entire tank contents. Volume changes attributable to temperature fluctuations and/or tank end deflection are compensated for in the volume calculations.

A constant hydrostatic pressure within the tank is maintained by adding or removing fluid as required through a graduated standpipe. When the tank contents reach temperature equilibrium, a one-hour precision test phase is conducted in which the exact amount of gasoline added to or drained from the standpipe to maintain a constant level is measured. Any difference between the calculated volume and measured volume during the one-hour test is considered leakage if it is equal to or more than 0.050 gallons per hour in accordance with criteria established by the National Fire Protection Association (Pamphlet No. 329).

The ~~III~~ results for the gasoline UST indicated a volume change of -0.021 gallons per hour. In accordance with the criteria in NFPA 329, the tank is considered to be competent. The test data calculations and results are presented in Appendix A.

2.2 SOILS INVESTIGATION

The purpose of the Phase I soil investigation was to characterize soil conditions (e.g., type and extent) beneath the site and evaluate the nature and extent of chemical constituents in these materials near the 11 manufacturing material USTs, the vapor recovery system collection container, and the railroad spur bulk delivery area. The investigation consisted of (1) drilling two soil borings and nine borings converted to monitoring wells, (2) collecting soil samples, and (3) submitting selected soil samples for chemical analysis. The following subsections provide detail regarding boring locations, drilling and sampling procedures, and the analytical program for the Phase I soil investigation.

2.2.1 Boring Locations

For this investigation, geologic information was developed from 11 borings, 9 of which were completed as monitoring wells (SLG-1 through SLG-9). Two borings (EB-1 and EB-2) were drilled to characterize specific soil stain areas at the site (see Figure 2).

Seven borings were completed during Phase Ia. These borings included SLG-1 through SLG-3 in the south tank farm and SLG-4 through SLG-6 in the north tank farm. Boring EB-1 was drilled between the railroad tracks near the southeast corner of the building. Four additional borings were drilled during

Phase Ib of the investigation. Borings SLG-7 through SLG-9 were located along the eastern site boundary. Boring EB-2 was drilled immediately adjacent to the north end of the east wall of the building. Boring locations are shown in Figure 2. The rationale for each of the Phase I boring locations is provided as follows:

EB-1: This boring investigated a ground stain near the railroad spur used for bulk delivery of raw materials. It is situated near the southeast corner of the building's loading dock.

EB-2: This boring investigated a ground stain beneath and around the discharge point of the vapor recovery system. The stain is located between the building and the railroad spur near the northeast side of the facility.

SLG-1 through SLG-3: These three borings were drilled to investigate the potential presence of chemical constituents in the vicinity of USTs ST-6a, ST-6b, ST-6c, ST-7, and ST-8 and in the south tank farm. SLG-1 is located in the vicinity of ST-8, a 30,000 gallon UST used to store TCA. SLG-2 and SLG-3 are located in the vicinities of ST-6a, ST-6b, ST-6c, which were used to store Corvus oil.

SLG-4 through SLG-6: These three borings were drilled to investigate the potential presence of chemical constituents in the vicinity of USTs ST-1 through ST-5 in the north tank farm. SLG-4 and SLG-6 are located proximal to USTs ST-1 and ST-2, which stored isopar naphtha, and SLG-5 is located in the vicinity of USTs ST-3, ST-4, and ST-5, which have previously stored and/or currently store anhydrous alcohol, VM&P naphtha, TCA, and off-specification Liquid Gold (see Table 1).

SLG-7 through SLG-9: These three borings are located along the eastern property boundary of the SLG facility. They were drilled to provide additional geologic information on areas along the eastern property boundary.

2.2.2 Drilling and Sampling Procedures

Phase I borings were completed using 4-1/4-inch and 8-1/4-inch inside diameter hollow-stem augers driven by a CME-750 drill rig. An HIA geologist logged the soils encountered and obtained both disturbed and relatively undisturbed soil samples for classification and chemical analysis. Logs of

borings are included in Appendix B, presented as Figures B1 through B11. Soils were classified in accordance with the Unified Soil Classification System (ASTM D2487-485) shown in Figure B12.

Soil samples were collected in 2-1/2-inch-diameter by 6-inch-long brass liners in a 3-inch outside diameter split-barrel drive sampler. Soil samples designated for chemical analysis were capped, sealed, and immediately placed in a cooler for delivery to the analytical laboratory. Samples were submitted for chemical analysis as soon as possible after collection to prevent loss of volatile components.

Soil cuttings generated during Phase I drilling (except from Borings SLG-7 through SLG-9) were collected and sealed in 55-gallon drums. Only the drill cuttings originating from below the water table in Borings SLG-7 through SLG-9 were containerized during Phase Ib. This procedure was determined to be adequate on the basis that (1) the borings are located in areas of no known spills and (2) any chemical constituents would most likely be migrating onsite via the ground-water system. The drums of collected drill cuttings were left onsite for appropriate disposal by SLG pending the results of the chemical analyses.

To prevent cross-contamination of soil samples during drilling, the drive sampler and brass liners were steam cleaned prior to each sampling event. Cross-contamination between boring locations was prevented by steam cleaning the hollow-stem auger sections, all downhole sampling equipment, and hand tools prior to commencement of drilling at each boring location. All decontamination water produced during these efforts was collected, stored, and

sealed in 55-gallon drums for subsequent disposal by SLG pending analytical results.

Soil sampling was attempted at 5-foot intervals during drilling of the monitoring-well borings (SLG-1 through SLG-6). Attempts to obtain undisturbed samples below the water table were largely unsuccessful where flowing sands were encountered. One soil sample from each of the monitoring-well borings was submitted for chemical analysis. Samples were selected based on their proximity to the bottom of the nearest UST and on visual observations made at the time of drilling.

More frequent sampling intervals (approximately every 2.5 feet) were conducted on shallow borings EB-1 and EB-2. This sampling frequency was necessary to characterize the vertical extent of chemical constituents associated with the ground stains investigated by these borings. Table 2 provides a summary of the soil investigation, including boring number, total depth drilled, samples selected for chemical analysis, the number of the nearest UST, and the depth of the tank bottom:

Table 2. Phase I Soil Investigation Summary

Boring	Total Depth (ft)	Depth of Chemical Analysis Samples (ft)	Nearest UST	Approximate Depth of UST Bottom (ft)
EB-1	10	0, 2.5, 7.5	NA	NA
EB-2	15	2.5, 7.5, 10, 15	NA	NA
SLG-1	46	35	ST-8	16
SLG-2	46	20	ST-6B	16
SLG-3	45.5	25	ST-6C	16
SLG-4	50.5	35	ST-1	13
SLG-5	45	25	ST-3, ST-4	13
SLG-6	45	20	ST-2	13
SLG-7	48	None	NA	NA
SLG-8	60.5	None	NA	NA
SLG-9	60	None	NA	NA

2.2.3 Soil Analytical Program

Soil samples collected during the Phase Ia investigation were submitted for chemical analysis in accordance with the schedule in the following table:

Table 3. Phase Ia Soil Analytical Program

<u>Analytical Method</u>	<u>Target Analytes</u>
EPA 502.2	Chlorinated volatile organics* - 1,1-Dichloroethene - 1,1-Dichloroethane - trans-1,2-Dichloroethene - 1,1,1-Trichloroethane - Tetrachloroethene - 1,2-Dichloroethane
Modified EPA 8015	Corvus oil, isopar, naphtha, VM&P naphtha, nitrobenzene
Gas Chromatography/ Flame Ionization Detector	Anhydrous Alcohol

* Method 502.2 is capable of detecting a wider range of volatile organic compounds; however, based on the raw materials used at SLG, this abbreviated list (frequently used by the laboratory) was selected.

This analytical program was developed based on the manufacturing materials previously used and those currently in use at the facility. Soil samples from Boring EB-1 were not analyzed for anhydrous alcohol because this material was never delivered to the facility by rail and would therefore not be present in the bulk delivery area. Phase Ia chemical analyses were performed by Cenref Laboratories of Brighton, Colorado.

Based on preliminary chemical results obtained during the Phase Ia program, the Phase Ib soil analytical program was developed to include an

expanded list of target volatile organic compounds (VOCs) and to achieve quantitative low-level detection limits for Corvus oil, isopar naphtha, VM&P naphtha, and anhydrous alcohol. The list of target VOCs was expanded to include the Hazardous Substance List (HSL) VOCs presented in Table 4. Table 5 below presents a summary of analytical methods and target analytes used in the Phase Ib soil investigation.

Table 5. Phase Ib Soil Analytical Program

<u>Analytical Method</u>	<u>Target Analytes</u>
EPA 8240 (GC/MS)	HSL VOCs and nitrobenzene
Extraction - GC/FID	Corvus oil, isopar naphtha, VM&P naphtha
Direct inject - GC	Anhydrous alcohol

GC/MS - gas chromatography/mass spectrometry
GC - gas chromatography
FID - flame ionization detector

The Phase Ib chemical analyses were performed by Vista Laboratories, Inc., of Wheat Ridge, Colorado.

2.3 GROUND-WATER INVESTIGATION

The purpose of the Phase I ground-water investigation was to (1) characterize ground-water conditions beneath the SLG facility, (2) evaluate the nature and extent of chemical constituents that may be present in ground water beneath the facility, (3) assess the integrity of the 11 manufacturing material USTs, and (4) evaluate potential sources (both onsite and offsite) of chemical constituents identified in ground water at the SLG facility. To achieve these objectives, HLA installed a network of nine ground-water

Table 4. Hazardous Substance List Volatile Organic Compounds

Acetone
 Benzene
 Bromodichloromethane
 Bromoform
 Bromomethane
 2-Butanone
 Carbon disulfide
 Carbon tetrachloride
 Chlorobenzene
 Chloroethane
 Chloroform
 2-Chloroethyl vinyl ether
 Chloromethane
 Cis-1,3-dichloropropene
 Dibromochloromethane
 1,1-Dichloroethane
 1,2-Dichloroethane
 1,1-Dichloroethene
 1,2-Dichloropropane
 Ethylbenzene
 2-Hexanone
 Methylene chloride
 4-Methyl-2-pentanone
 Styrene
 Tetrachloroethene
 1,1,2,2-Tetrachloroethane
 Trans-1,2-Dichloropropene
 Trans-1-3-Dichloropropene
 1,1,1-Trichloroethane
 1,1,2-Trichloroethane
 Trichloroethene
 Toluene
 Vinyl acetate
 Vinyl chloride
 Total xylenes

monitoring wells at the site, collected ground-water samples for chemical analysis, and measured ground-water elevations to determine the direction of ground-water flow. The following subsections provide detail regarding the monitoring-well locations, monitoring-well installation, development and sampling procedures, and the ground-water analytical program.

2.3.1 Monitoring-Well Locations

The Phase I ground-water investigation included installation of nine monitoring wells from which ground-water samples could be collected and water levels could be measured. Six monitoring wells (SIG-1 through SIG-6) were installed during Phase Ia, and three monitoring wells (SIG-7 through SIG-9) were installed during Phase Ib. The monitoring wells were installed at the boring locations shown in Figure 2 and discussed in Section 2.2.1. The rationale for each monitoring-well location is briefly summarized below:

- SIG-1 through SIG-3: These wells were installed to assess whether chemical constituents were present in ground water beneath the south tank farm. The USTs in this area were used to store TCA, nitrobenzene, VM&P naphtha, and off-specification Liquid Gold products.
- SIG-4 through SIG-6: These wells were installed to assess whether chemical constituents were present in ground water beneath the north tank farm. These tanks have been used to store isopar naphtha, nitrobenzene, TCA, and anhydrous alcohol.
- SIG-7 through SIG-9: These three monitoring wells were installed along the eastern property boundary, based on Phase Ia data which indicated that this area was upgradient of the existing facility. SIG-7 and SIG-8 were located immediately upgradient of the north and south tank farms, respectively. These three monitoring wells were installed to obtain information regarding the potential for offsite sources of chemical constituents in the ground water flowing beneath the SIG site.

2.3.2 Monitoring-Well Installation, Development, and Sampling Procedures

Monitoring-well installation commenced immediately upon completion of drilling each soil boring. Phase Ia monitoring wells (SLG-1 through SLG-6) were designed to extend to a minimum of 10 feet below the water table. These wells were constructed with 2-inch-diameter flush couple threaded Schedule 40 PVC casing. The top of the well screen was set approximately 5 feet above the water table to allow collection of immiscible liquid products (if any) floating on the water-table surface. Blank 2-inch-diameter PVC casing extended from the top of the PVC screen to ground surface. The monitoring wells were completed by filling the annular space outside the well casing with coarse silica sand. The sand pack extended from the bottom of the boring to several feet above the top of the screened portion. A bentonite pellet seal was used to separate the sand pack from the overlying bentonite cement seal, which extended from top of the bentonite seal to ground surface. Phase Ia monitoring wells were completed at the surface with a protective steel casing, and the top of the PVC pipe inside the protective casing was fitted with a locking well cap.

Phase Ib monitoring wells (SLG-7 through SLG-9) were constructed in a similar manner, with the following exceptions:

1. The monitoring wells were designed to extend to the bottom of the saturated alluvium instead of 10 feet below the water table.
2. Four-inch-diameter PVC casing was used instead of 2-inch-diameter casing.
3. The monitoring wells were completed approximately 2.5 feet above ground surface instead of at ground level.

Table 6 presents a summary of the ground-water monitoring well completion details, and Figures B3a through B11a (provided in Appendix B) show well completion diagrams.

All PVC casing and screen sections were decontaminated by steam cleaning immediately prior to monitoring-well installation.

Upon completion of monitoring-well installation and prior to monitoring-well sampling, each well was developed by a combination of pumping, surging, and bailing to flush and stabilize the sand pack in the immediate vicinity of the well screen. Whenever possible, a minimum of three casing volumes of ground water was removed from each well during development. In some cases, fewer than three volumes of ground water were removed during development because of very slow recharge of water into the well. Development water was collected and stored in 55-gallon drums for subsequent processing by SLG.

Monitoring wells SIG-1 through SIG-6 were sampled during Phase Ia, and monitoring wells SIG-1 through SIG-9 were sampled during Phase Ib. Sampling procedures for both events were essentially the same and are summarized below:

- Prior to purging or sampling, all equipment was decontaminated. Bailers, pumps, and meter probes used in sampling were steam cleaned and triple rinsed with deionized (DI) water at the sampling site prior to use and after sampling. Sampling pumps had three volumes (pump and hose volume) of DI water flushed through them prior to and after sampling.
- Prior to sampling, the depth to water in each well was measured and recorded to the nearest 0.01 foot using a water-level indicator. The measuring device was decontaminated with distilled water prior to use at each well.
- Field measurements of specific conductivity, temperature, and pH were recorded after each purge volume and prior to sampling. The meters were calibrated in accordance with manufacturer's recommendations prior to use.

Table 6. Monitoring-Well Completion Summary

<u>Monitoring Well</u>	<u>Total Depth (feet)</u>	<u>Total Depth of Casing (feet)</u>	<u>Depth to Water (feet)</u>	<u>Screened Interval (feet)</u>	<u>Depth to Top of Sand Pack (feet)</u>	<u>Bentonite Seal Interval (feet)</u>	<u>Bentonite/Cement Seal (feet)</u>	<u>Comments</u>
SIG-1	46	42.9	34.85	27.9-42.9	29	27.5-29	0-27.5	PVC casing lifted during completion from total depth of 45 feet to total depth of 42.9 feet. Approximately 11 gallons of municipal water added during installation.
SIG-2	45	41	34.00	26-41	24.5	23-24.5	0-23	Approximately 25 gallons of municipal water added during well installation.
SIG-3	45.5	45	33.75	30-45	26.4	10-14	0-10	Natural soils sloughed into boring during completion from 14 to 16.4 feet. Approximately 25 gallons of municipal water added during installation.
SIG-4	50.5	39.5	35.00	24.5-39.35	22	20.5-22	0-20.5	Flowing sands from 39.5-50.5. Approximately 25 gallons of municipal water added during installation.
SIG-5	45	43.5	35.30	28.5-43.5	24.5	23-24.5	0-23	Approximately 25 gallons of municipal water used during installation.

Table 6. (Continued)

Monitoring Well	Total Depth (feet)	Total Depth of Casing (feet)	Depth to Water (feet)	Screened Interval (feet)	Depth to Top of Sand Pack (feet)	Bentonite Seal Interval (feet)	Bentonite/ Cement Seal (feet)	Comments
SIG-6	45	41	35.25	26-41	24.5	23-24.5	0-23	Approximately 25 gallons of municipal water used during installation.
SIG-7	48	46.7	33.80	26.7-46.7	24.5	23.3-24.6	0-23.3	Approximately 2.5 gallons of municipal water used during installation.
SIG-8	60.5	58	31.10	28-58	25.4	23.2-25.4	0-23.2	Approximately 25 gallons of municipal water used during installation. Bottom 3-4 feet of screen is surrounded by in-situ sands that caved during installation.
SIG-9	60	47	29.90	17-47	15	14-15	0-14	In-situ sands caved into boring from 38-60 feet.

- Typically, three well volumes of water were removed from each well prior to sampling by using either a stainless steel sampling pump or a stainless steel bailer. In the event that a well was pumped or bailed dry prior to removing three well volumes, the well was allowed to recover sufficiently to permit sample collection. All purged well water was containerized in 55-gallon drums and stored onsite for subsequent appropriate processing by SLG pending analytical results.
- Upon completion of well purging, sample containers were filled, sealed, wrapped in protective packing materials, and immediately placed in an ice chest and chilled prior to delivery to the analytical laboratory. All samples were delivered to the laboratory using chain-of-custody protocol.

In addition to the ground-water samples obtained during the Phase I investigation, rinse water blank samples were obtained during the Phase Ia and Phase Ib investigations and duplicate ground-water samples were obtained during the Phase Ib investigation. Two and three rinse water blank samples were obtained during the Phase Ia and Phase Ib investigations, respectively, and three duplicate samples were obtained during the Phase Ib investigation. The rinse water blank provides a measure of the effectiveness of equipment cleaning between monitoring wells, and the duplicate sample provides an indication of laboratory data quality.

2.3.3 Ground-Water Analytical Program

Ground-water samples obtained during the Phase Ia and Phase Ib investigations were submitted for laboratory chemical analysis in accordance with the schedule established for Phase Ia and Phase Ib soil samples. Phase Ia ground-water samples were analyzed for the list of constituents presented in Table 3, and ground-water samples obtained during the Phase Ib investigation were analyzed for the constituents presented in Tables 4 and 5. Phase Ia

chemical analyses were performed by Cenref Laboratories, and Phase Ib chemical analyses were performed by Vista Laboratories, Inc.

The rinse water blank samples and duplicate ground-water samples obtained during the Phase Ia and Phase Ib investigations were submitted for chemical analyses in accordance with the schedules mentioned above.

3.0 PHASE I RESULTS

The results of the Phase I Ground-Water Site Investigation are presented in this section. The results are discussed in the same format as the field program (i.e., results of the tank tightness test, soil investigation, and ground-water investigation are discussed separately). Discussions of the subsurface soil conditions, soil analytical results, ground-water conditions, and ground-water analytical results are provided.

3.1 TANK TIGHTNESS TEST RESULTS

As stated previously, the results of the tank tightness test indicate that over the course of the one-hour precision test, the tank displayed a volume change of -0.021 gallons per hour. Based on the criteria provided in NFPA Pamphlet 329, the test results indicate that the gasoline UST is considered competent. Because the test method employed tests the entire tank system, the associated distribution piping (within approximately 42 inches above ground surface) is also considered competent.

3.2 SOIL INVESTIGATION RESULTS

A soil investigation was designed to provide information regarding the character of subsurface soil conditions and the nature and extent of chemical constituents in soil near the north and south tank farms, the vapor recovery system discharge, and the railroad spur bulk delivery area. The results of the Phase I investigation as they apply to each of these objectives are discussed in the following subsections.

3.2.1 Subsurface Soil Conditions

The subsurface soil conditions at the site were investigated by drilling 11 borings ranging in depth from 10 to 60 feet. A generalized summary of the soils encountered at each of the tank farms and along the eastern boundary are summarized below:

South Tank Farm (Borings SLG-1 to SLG-3)

<u>Depth</u>	<u>Soil Description</u>
0-20	Brown, medium-grained sand, medium dense, probable tank backfill material
20-25	Brown to dark brown sandy silts or silty sand with occasional cobbles
25-46	Brown to light brown sand and silty sand. Interbedded clean and silty/clayey sands from 35 to 40 feet

North Tank Farm (Borings SLG-4 to SLG-6)

0-18	Brown sand and silty sand, probable tank backfill material
18-30	Brown sandy silt with interbedded lenses of fine sand and occasional cobbles
30-40	Brown sand and silty sand with interbedded lenses of coarse sand from 30 to 35 feet
40-50	Brown clayey sand interbedded with silts and sands

Eastern Property Boundary (Borings EB-1, EB-2, and SLG-7 to SLG-9)

0-12	Brown silty sand
12-25	Dark brown sandy silt with occasional medium-grained sand lenses
25-58	Light brown silty sand, fine- to coarse-grained
58-60	Grey green sandy siltstone (detected only in Boring SLG-8)

As shown in the above summaries, soil conditions across the site are relatively uniform. Bedrock was encountered in Boring SLG-8 at a depth of 58 feet and consisted of sandy siltstone. Boring SLG-7 encountered very stiff sandy silt at 45 feet, which may represent the top of the weathered bedrock; however, drilling was halted before the occurrence of the bedrock surface could be verified. Based on information obtained from Borings SLG-7 and SLG-8, bedrock is estimated to be approximately 65 to 70 feet deep in the vicinity of Boring SLG-9.

3.2.2 Soil Analytical Results

The results of the chemical analyses performed on soil samples obtained during Phase I are summarized in Table 7. This table presents a summary of analytes detected in Phase I. A complete summary of Phase I analytical results, including target analytes, analytical results, associated method reporting limits, and the laboratory analytical report, is provided in Appendix C.

Detection limits reported for certain samples were increased when samples had to be diluted to provide on-scale instrument response for high concentration compounds. Additionally, certain compounds have been flagged in Table 7 and throughout the text with an asterisk (*) to indicate that the compound was detected at a concentration below the established method reporting limit and that the reported concentration may therefore be unreliable. A discussion of soil analytical results presented by area is provided in the following subsections.

Table 2. SUMMARY OF PHASE I SOIL ANALYTICAL RESULTS

Boring ID Sample Depth (Concentrations in ppb)	Phase Ia						Phase Ib						
	SLG-1 35 ft.	SLG-2 20 ft.	SLG-3 25 ft.	SLG-4 35 ft.	SLG-5 25 ft.	SLG-6 20 ft.	EO-1 0 ft. 2.5 ft. 7.5 ft.	EO-2 2.5 ft. 7.5 ft. 10 ft. 15 ft.	EO-2 2.5 ft. 7.5 ft. 10 ft. 15 ft.	EO-2 2.5 ft. 7.5 ft. 10 ft. 15 ft.	EO-2 2.5 ft. 7.5 ft. 10 ft. 15 ft.	EO-2 2.5 ft. 7.5 ft. 10 ft. 15 ft.	
ANALYSIS													
1,1-Dichloroethene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	3,200	3,800	< 250	< 5
1,1,1-Trichloroethane	690	100	40	57	39	50	57	50	130	110,000	85,000	12,000	7
Trichloroethene	< 2.5	< 2.5	< 2.5	1,700	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 25	< 2,000	< 250	< 5
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	190	900	980	2
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	150	400	370	< 5
Total Xylenes	NA	NA	NA	NA	NA	NA	NA	NA	NA	5,200	3,300	3,200	< 5
VMP Naphtha	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	840,000	500,000	350,000	< 200
Corvus Oil	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	< 2,000,000	200,000,000	< 2,000,000	< 2,000,000	12,000,000	13,000,000	6,500,000	< 2,000

Notes: < 0.1 - Constituent below detection limit of 0.1 ppb

NA - Sample not analyzed for indicated parameter

ppb - Parts per billion

* Indicates compound was identified in the sample at a concentration below the established method reporting limit and that the reported concentration may be unreliable.

Railroad Spill Bulk Delivery Area

This area was investigated in Phase Ia by Boring EB-1. Soil samples contained TCA at concentrations ranging from 50 to 130 parts per billion (ppb). Corvus oil was detected in one sample at 20,000,000 ppb. TCA was detected in all three samples, with the highest concentration in the sample at 7.5 feet. Corvus oil was detected only in the surface sample (0 feet). VM&P naphtha (VM&P), isopar naphtha (isopar), nitrobenzene, and the other VOCs listed in Table 3 were not detected above their respective method reporting limits.

Vapor Recovery System Collection Container

This area was investigated in Phase Ib by Boring EB-2. Soil samples contained 1,1-dichloroethene (DCE), TCA, toluene, ethylbenzene, xylene, VM&P, and Corvus oil. TCA was detected in all four sample depths (2.5, 7.5, 10, and 15 feet) at concentrations of 110,000, 85,000, 12,000, and 7 ppb, respectively. Toluene, ethylbenzene, xylene, VM&P, and Corvus oil were detected in soil samples to depths of 10 feet at concentrations ranging from 190 to 980 ppb, 150 to 400* ppb, 3,200 to 5,200 ppb, 350,000 to 840,000 ppb, and 6,500,000 to 13,000,000 ppb, respectively. DCE was detected only in the 2.5-foot and 7.5-foot samples at concentrations of 3,200 ppb and 3,800 ppb, respectively.

Except for three constituents, the Phase I results indicated that the concentrations of chemical constituents in soil decreased with depth in this area. DCE, toluene, and ethylbenzene exhibited a pattern opposite to this;

* Indicates that the compound was identified in the sample at a concentration below the established sample detection limit and that the reported concentration may be unreliable.

concentrations of these three constituents appeared to increase slightly with depth. DCE, toluene, and ethylbenzene were not detected above method detection limits in samples deeper than 10 feet. Based on these data, it does not appear that significant concentrations of chemical constituents are present in soil at depths of 15 feet or greater.

South Tank Farm

This area was investigated in Phase Ia by Borings SLG-1 to SLG-3. One soil sample was submitted for analysis from each boring from depths of 35 feet (SLG-1), 20 feet (SLG-2), and 25 feet (SLG-3). TCA was the only Phase I analyte detected in these soil samples at concentrations ranging from 40 ppb (SLG-3) to 690 ppb (SLG-1). A sample from Boring SLG-1 was collected at a depth of 35 feet, which is at or below the water table in this area; therefore, the reported concentration may be somewhat affected by the concentration of this constituent in ground water (see Section 3.3). Samples from SLG-1 to SLG-3 were obtained approximately 19 feet, 4 feet, and 9 feet below the bottom of respective storage tanks ST-8, ST-5B, ST-6C.

North Tank Farm

This area was investigated in Phase Ia by Borings SLG-4 to SLG-6. One soil sample was submitted for chemical analysis from each boring from depths of 35 feet (SLG-4), 25 feet (SLG-5), and 20 feet (SLG-6). TCA was detected in all three samples at concentrations ranging from 39 to 57 ppb. In addition, trichloroethene (TCE) was detected in the soil sample from SLG-4 at a concentration of 1,700 ppb. The soil samples obtained from SLG-4 to SLG-6

were collected at depths of approximately 22, 12, and 8 feet below storage tanks in the north tank farm.

The concentration of TCE at 1,700 ppb appears to be anomalous, based on the manufacturing materials used at the facility. Although it is not uncommon to find trace amounts of TCE in commercial grade TCA, the results do not support such trace amounts as the source in this case. If the concentration of TCE were attributable to impurities in TCA, the concentration of TCA would probably be much greater than the concentration of TCE. However, the opposite is true in this case. This concentration of TCE is further suspect because TCE was not detected in any of the soil samples obtained from borings adjacent to either the north or south tank farms except for boring SLG-4. SLG-4, adjacent to UST ST-1, was never reported by SLG to store TCA.

3.3 GROUND-WATER INVESTIGATION RESULTS

The ground-water investigation was developed to provide information on ground water conditions beneath the SLG facility and to evaluate the nature and extent of chemical constituents in ground water. These data will be used in conjunction with the soil data to assess the integrity of the 11 manufacturing material USTs and to evaluate the potential that chemical constituents are migrating via the ground-water system beneath SLG from offsite sources. The following subsections discuss the results of the Phase I ground-water investigation.

3.3.1 Ground-Water Conditions

Ground-water conditions at the site were investigated by installing a network of nine monitoring wells at the locations shown in Figure 2. Water-

level measurements were obtained from monitoring wells SLG-1 through SLG-6 during Phase Ia (March 1988) and from monitoring wells SLG-1 through SLG-9 during the Phase Ib investigation (June 1988). Figure 3 presents a water-table contour map using the Phase Ib water-level measurements (water levels did not change significantly between March and June).

Based on the water table configuration shown in Figure 3, ground-water flow is to the west/northwest beneath the SLG facility. The gradient of the water table is approximately 0.011, and the gradient is slightly steeper in the southeast portion of the site. Based on hydraulic conductivities representative of the soils beneath the site and the water-table gradient indicated in Figure 3, ground-water velocities can be expected to range from 50 to 5,000 feet per year.

3.3.2 Ground-Water Analytical Results

Results of chemical analyses performed on Phase I ground-water samples are summarized in Table 8. This table presents a summary of analytes detected in Phase I. A complete Phase I analytical summary, which lists the target analytes, analytical results, method reporting limits, and the analytical laboratory report, are provided in Appendix C.

Detection limits reported for certain samples were increased when samples had to be diluted to provide on-scale instrument response for high concentration compounds. Additionally, certain compounds have been flagged in Table 8 and throughout the text with an asterisk (*) to indicate that the compound was detected at a concentration below the established method reporting limit and that the reported concentration may therefore be unreliable.

Table 8. SUMMARY OF PHASE I GROUND-WATER ANALYTICAL RESULTS

Monitoring Well ID Sampling Date (Concentrations in ppb)	SLG-1			SLG-2		SLG-3		SLG-4			SLG-5		SLG-6		SLG-7	SLG-8		SLG-9
	Phase 1a	Phase 1b	Phase 1b (DUP)	Phase 1a	Phase 1b	Phase 1a	Phase 1b	Phase 1a	Phase 1b	Phase 1b (DUP)	Phase 1a	Phase 1b	Phase 1a	Phase 1b	Phase 1b	Phase 1b	Phase 1b (DUP)	Phase 1b
ANALYSIS																		
1,1-Dichloroethene	110	1,100	540	52	100	66	420	67	140	140	9	37	3.2	26	7.9	1.5	1.5	1.5
1,1-Dichloroethane	670	58	74	11	4.5	40	180	40	17	17	20	6.9	5.7	4.3	1.5	1.5	1.5	1.5
Trans-1,2-Dichloroethene	12.5	2.9	2.0	12.5	20	12.5	1.7	12.5	1.5	1.5	12.5	1.5	12.5	1.5	1.5	35	35	1.5
Chloroform	NA	4.3	4.7	NA	1.0	NA	1.5	NA	1.0	1.3	NA	1.5	NA	2.5	1.5	1.5	1.5	1.5
1,2-Dichloroethane	12.5	2.0	1.5	12.5	1.5	12.5	1.5	12.5	1.5	1.5	12.5	1.5	12.5	1.5	1.5	1.5	1.5	1.5
1,1,1-Trichloroethane	1,300	13,000	7,000	920	1000	750	5,800	270	350	360	93	120	38	77	47	6.1	5.9	1.5
Trichloroethene	25	1.5	19	21	46	15	18	12.5	1.1	1.1	12.5	1.5	12.5	1.5	2.4	36	35	0.6
Tetrachloroethene	9.6	1.5	3.3	3.4	1.5	4.4	1.5	1.4	1.5	1.5	0.1	1.5	0.1	1.5	1.5	2.9	2.9	1.5
Chlorobenzene	NA	1.5	2.5	NA	1.5	NA	1.5	NA	1.5	1.5	NA	1.5	NA	1.5	1.5	1.5	1.5	1.5
VNIP Naphtha	1200,000	260	270	1200,000	200	1200,000	240	1200,000	110	110	1200,000	110	1200,000	110	110	110	110	110
Corvus Oil	1200,000	120	180	1200,000	200	1200,000	150	1200,000	110	110	1200,000	110	1200,000	110	110	110	110	110

Notes: (0.1) - Constituent below detection limit of 0.1 ppb

NA - Sample not analyzed for indicated parameter

ppb - Parts per billion

DUP - Duplicate Sample

1 - Indicates compound was identified in the sample at a concentration below the established method reporting limit and that the reported concentration may be unreliable.

Phase Ib analytical results will be used to discuss the nature and extent of chemical constituents in ground water. This data set was selected because (1) the Phase Ia data are considered to be preliminary, (2) the Phase Ib analytical program was significantly more extensive, (3) the Phase Ib results provide a consistent chemical data set for all monitoring wells sampled at one point in time, and (4) with the exception of two wells (SLG-1 and SLG-3), the chemical results for both Phase Ia and Phase Ib are generally consistent. The Phase Ia results for several constituents in water samples from wells SLG-1 and SLG-3 are 10 to 100 times lower than those detected in Phase Ib. These differences may be attributed in part to the fact that municipal water was added to these wells during installation and was not fully recovered during development (which would tend to temporarily dilute constituent concentration in ground water near the monitoring well).

The primary chemical constituents detected in ground water at the SLG facility are DCE, 1,1-dichloroethane (DCA), trans-1,2-dichloroethene (T-DCE), TCA, TCE, VM&P, and Corvus oil. Table 8 indicates that other volatile organic compounds (carbon disulfide, chloroform, 1,2-DCA, 2-hexanone, tetrachloroethene, and chlorobenzene) are present in the ground water; however, these constituents were detected sporadically and typically at concentrations below the method reporting limits. No further discussion of these constituents will be presented.

Figure 4 presents a site plan that shows concentrations of the primary chemical constituents detected in ground water plotted next to respective monitoring-well locations. Concentrations of DCE, DCA, and TCA all follow essentially the same distribution pattern. The highest concentrations of

these three constituents were detected in the six monitoring wells near the north and south tank farms. Concentrations of DCE, DCA, and TCA in ground-water samples from the south tank farm ranged from 100 to 1,100 ppb, 4.5* to 180 ppb, and 1,000 to 13,000 ppb, respectively. The concentrations of these same constituents in samples from the north tank farm monitoring wells ranged from 26 to 140 ppb, 4.3* to 17 ppb, and 77 to 350 ppb, respectively. TCA was detected in ground water along the eastern boundary in wells SLG-7 (47 ppb) and SLG-8 (6.1 ppb). DCE was detected in only one well sample (SLG-7) in this area at a concentration of 7.9 ppb, and DCA was not detected in any of the samples from monitoring wells SLG-7 to SLG-9.

TCE was detected in the three south tank farm monitoring wells (SLG-1 to SLG-3) and the three monitoring wells along the eastern site boundary (SLG-7 through SLG-9) at concentrations ranging from 18 to 46 ppb and 2.4* to 36 ppb, respectively. T-DCE was also detected in all three south tank farm wells at concentrations of 1.7* to 20 ppb and in the sample from monitoring well SLG-8 at a concentration of 35 ppb. Monitoring well SLG-8 is hydraulically upgradient from the south tank farm monitoring wells.

VM&P and Corvus oil were detected only in samples from the three south tank farm monitoring wells. VM&P was detected at concentrations of 200 to 260 ppb, and Corvus oil was detected at concentrations of 120 to 200 ppb.

While the VM&P and Corvus oil data may suggest a relatively uniform distribution of these constituents in ground water beneath the south tank farm, rinse water blank data suggested that detections of VM&P and Corvus oil in samples from SLG-1 and possibly SLG-2 may be a result of ineffective decontamination procedures. The rinse water blank sample obtained after

sampling well SLG-2 and prior to sampling well SLG-1 contained VM&P at 330 ppb, Corvus oil at 100 ppb, and TCA at 8.6 ppb. Based on the order that these wells were sampled (SLG-3, SLG-2, and SLG-1) and the rinse water blank data, it is possible that the concentrations of VM&P and Corvus oil in wells SLG-1 and possibly SLG-2 were carryover from ineffective decontamination procedures subsequent to sampling well SLG-3. The levels of chemical constituents in the remaining two rinse water blank samples were all below the sample reporting limits.

4.0 CONCLUSIONS

This section presents conclusions regarding the integrity of the 12 USTs, concentrations of chemical constituents in soil and ground water, and the potential that offsite sources (e.g., upgradient facilities) are impacting ground water beneath the SIG facility. These conclusions are based on the results of the Phase I investigation.

4.1 UNDERGROUND STORAGE TANK INTEGRITY

The integrity of the 12 USTs was investigated by performing a tank tightness and soil and ground-water investigations. Based on the Phase I results discussed in the previous section, the following conclusions were drawn:

- The gasoline UST was determined to be competent; therefore, the integrity of this tank is not in question.
- Phase I analytical results indicated the presence of tank contents in soil and ground water beneath the 11 manufacturing material USTs. The presence of these constituents in these media suggests that an inadvertent loss of these materials may have occurred.

The levels of the chemical constituents in soil and ground water near the two tanks farms are not necessarily indicative of significant leaks from the tanks; however, the data indicate that the tank farms may be a source of some of the chemical constituents in soil and ground water in these areas. The levels of chemical constituents present may be the result of (1) accidental spills and/or overfilling of the tanks over time and/or (2) small leaks in the tanks and/or ancillary underground piping.

Although DCE, DCA, and TCE (which were detected in soil and/or water) were never stored in these tanks, these materials are typically present as impurities of commercial-grade TCA. The concentrations of DCE, DCA, and TCE in ground water near the tank farms relative to the concentrations of TCA indicate that the tank farms may be the source of these constituents in ground water in these areas.

4.2 NATURE AND EXTENT OF CHEMICAL CONSTITUENTS IN SOIL

Chemical constituents were also detected in soils near the vapor recovery system collection container and the railroad spur bulk delivery areas. The surface soils in these areas were visibly discolored. The types of constituents detected at each location are consistent with the history of these areas. Corvus oil and TCA were detected in the railroad spur bulk delivery area, where bulk quantities of these materials were unloaded. Concentrations of TCA increased with depth, suggesting that flushing of the surface soils has occurred over time. Based on the Phase I results, it appears that TCA may be present at this location at depths greater than 7.5 feet (maximum depth of data). The lateral extent of chemical constituents in this area can be inferred from the ground stain, which is areally restricted (approximately 20 feet by 10 feet).

Levels of TCA, VM&P, and Corvus oil in soil samples obtained near the vapor recovery system collection container indicate that these materials are present above the method reporting limit to depths of at least 10 feet. TCA and toluene were the only constituents detected at a depth of 15 feet in low concentrations (7 ppb and 2* ppb, respectively). Toluene, ethylbenzene, and xylenes were also detected above method reporting limits to depths of 10 feet.

These materials have never been known to be used at the facility but may be present as components of both VM&P and Corvus oil. The vertical extent of these chemical constituents in soil near the vapor recovery system appears to be limited to depths less than 15 feet. The lateral extent can be inferred from ground staining and appears to be areally restricted (approximately 35 feet by 6 feet).

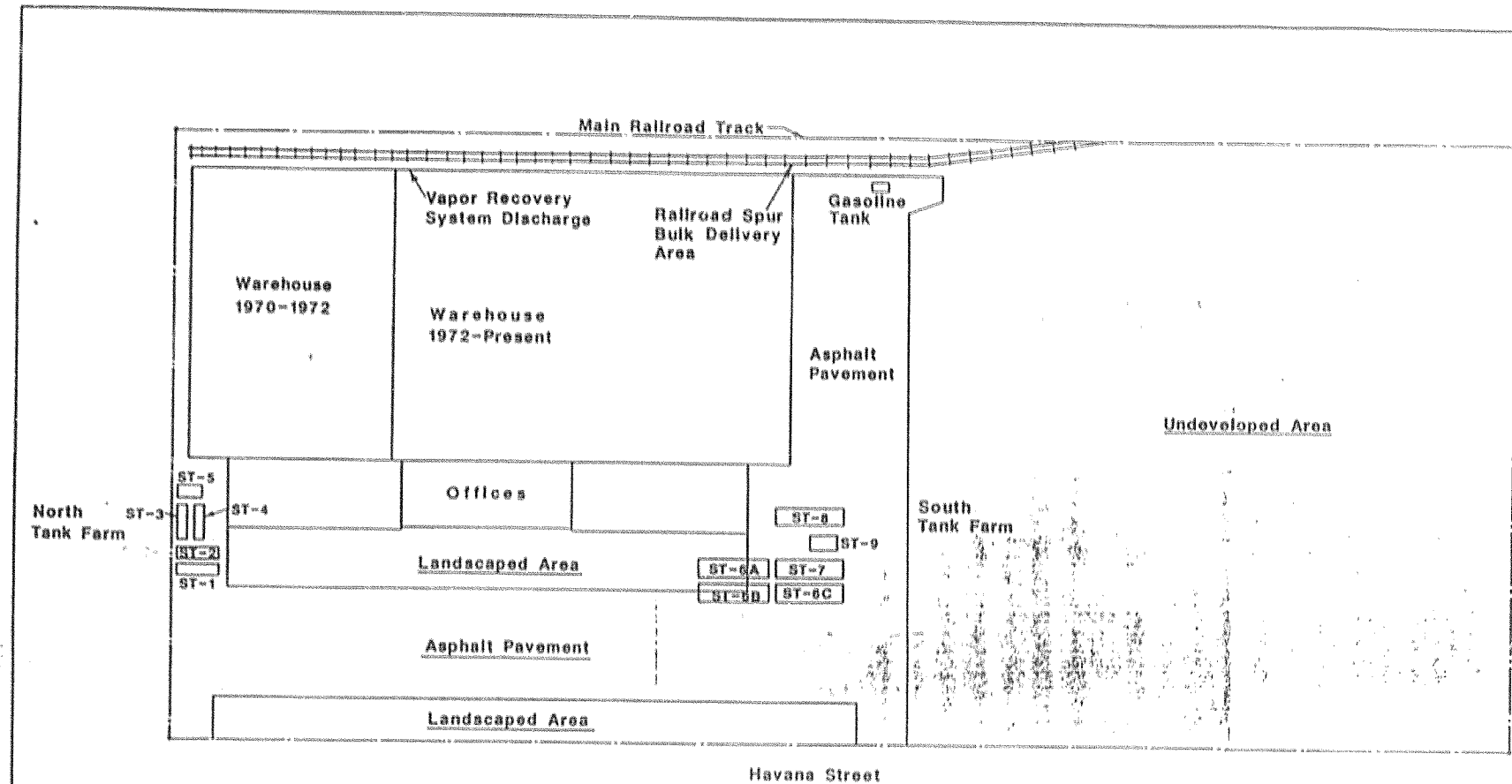
4.3 NATURE AND EXTENT OF CHEMICAL CONSTITUENTS IN GROUND WATER

Ground-water analytical results indicated the presence of chemical constituents in ground water in the vicinity of both tank farms and along the eastern property boundary. The source of some of the chemical constituents near the tank farms may be associated with the tank farms themselves (see Section 4.1).

Chemical constituents in water samples from two and possibly all three monitoring wells located along the eastern property boundary appear to be originating from an offsite source or sources. TCE was detected in ground-water samples from monitoring wells SIG-8 and SIG-9 at concentrations of 36 ppb and 8.6 ppb, respectively, and T-DCE was detected in the sample from SIG-8 at a concentration of 35 ppb. Both of these wells are located 240 to 350 feet hydraulically upgradient of the north tank farm and the areas where chemical constituents are present in surface soils. It is highly unlikely that activities at the SIG facility are the source of these constituents.

TCA, DCE, and TCE were detected in ground-water samples from monitoring well SIG-7, which is located upgradient of the north tank farm. SIG-7 is located approximately 25 feet from Boring EB-2, which investigated the soil stain near the vapor recovery system collection container. Soil samples from

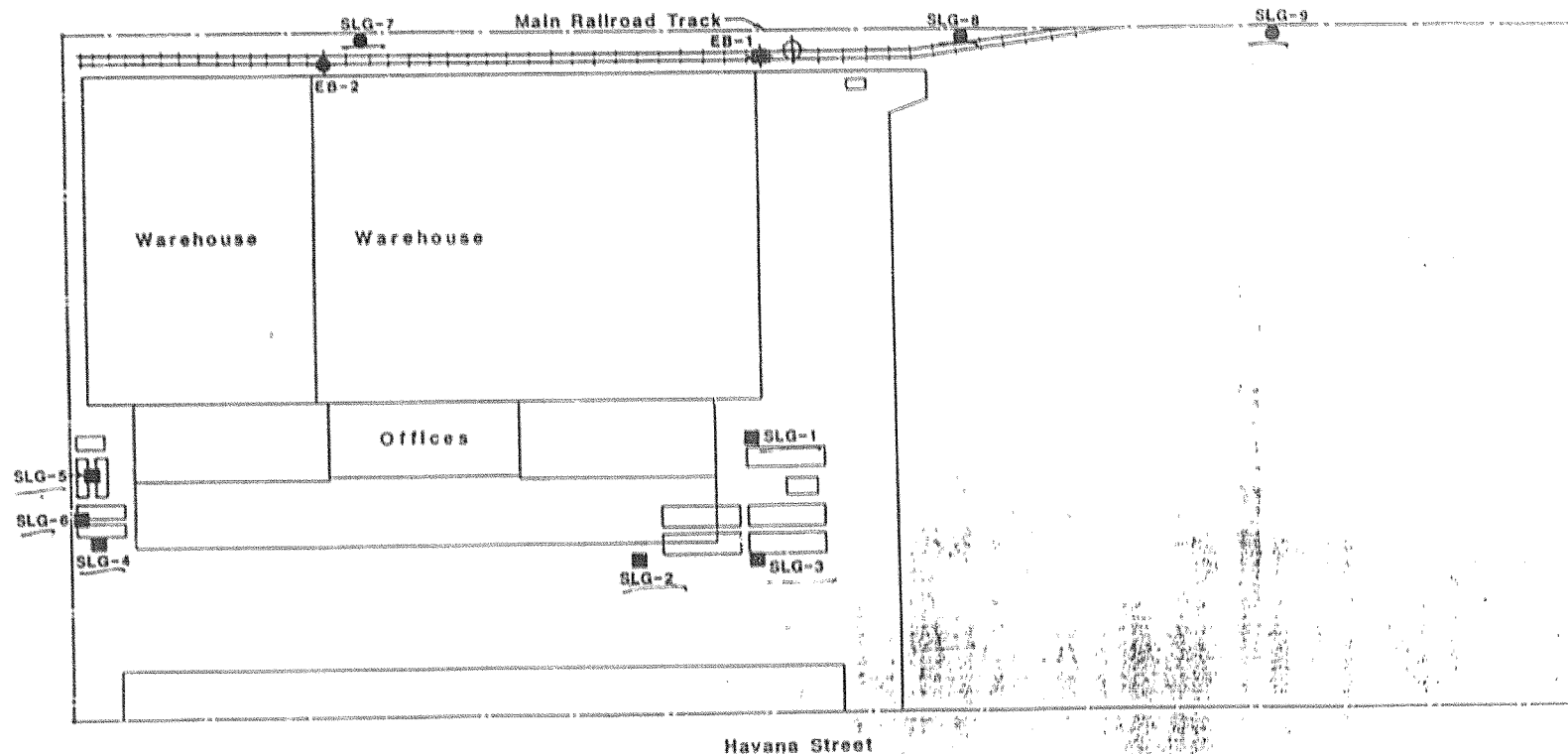
EB-2 contained detectable levels of TCA and DCE to depths of 15 and 7.5 feet, respectively. Because of the proximity of the soil stain to monitoring well SIG-7, the concentrations of chemical constituents in ground-water near this well may be impacted by the concentrations of chemical constituents in soils near the vapor recovery system. The trace amounts (2.4* ppb) of TCE detected in SIG-7 may be associated with the TCA as an impurity or may be originating from an offsite source.



N

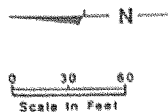
0 30 60
Scale in Feet

HLA Harding Lawson Associates Engineers, Geologists & Geophysicists	Site Plan Scott's Liquid Gold Denver, Colorado		FIGURE
			1
Drawn by AT Jr.	Job Number 18696,001.10	Approved <i>[Signature]</i>	Date 8/88
		Revised Date	

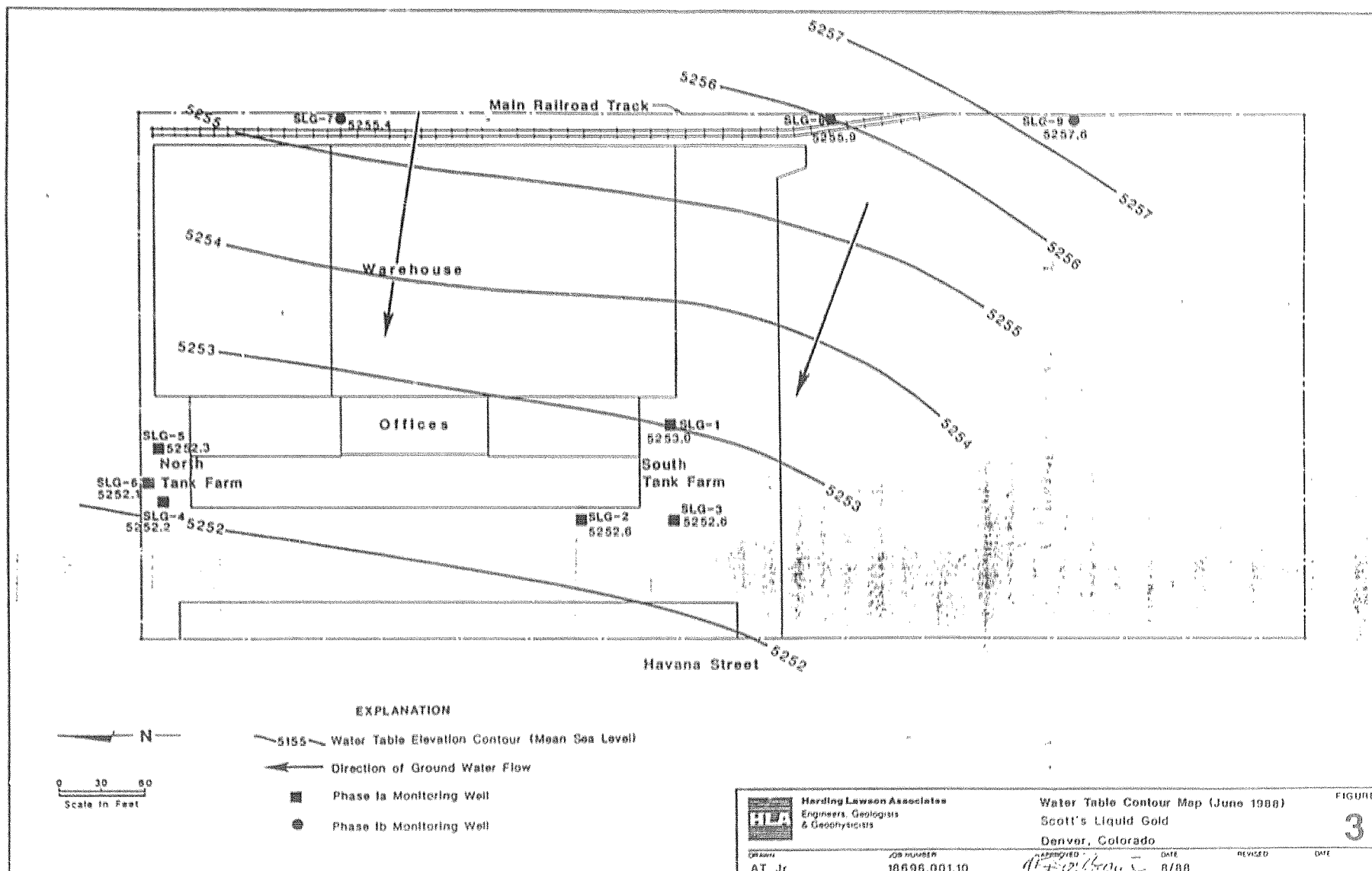


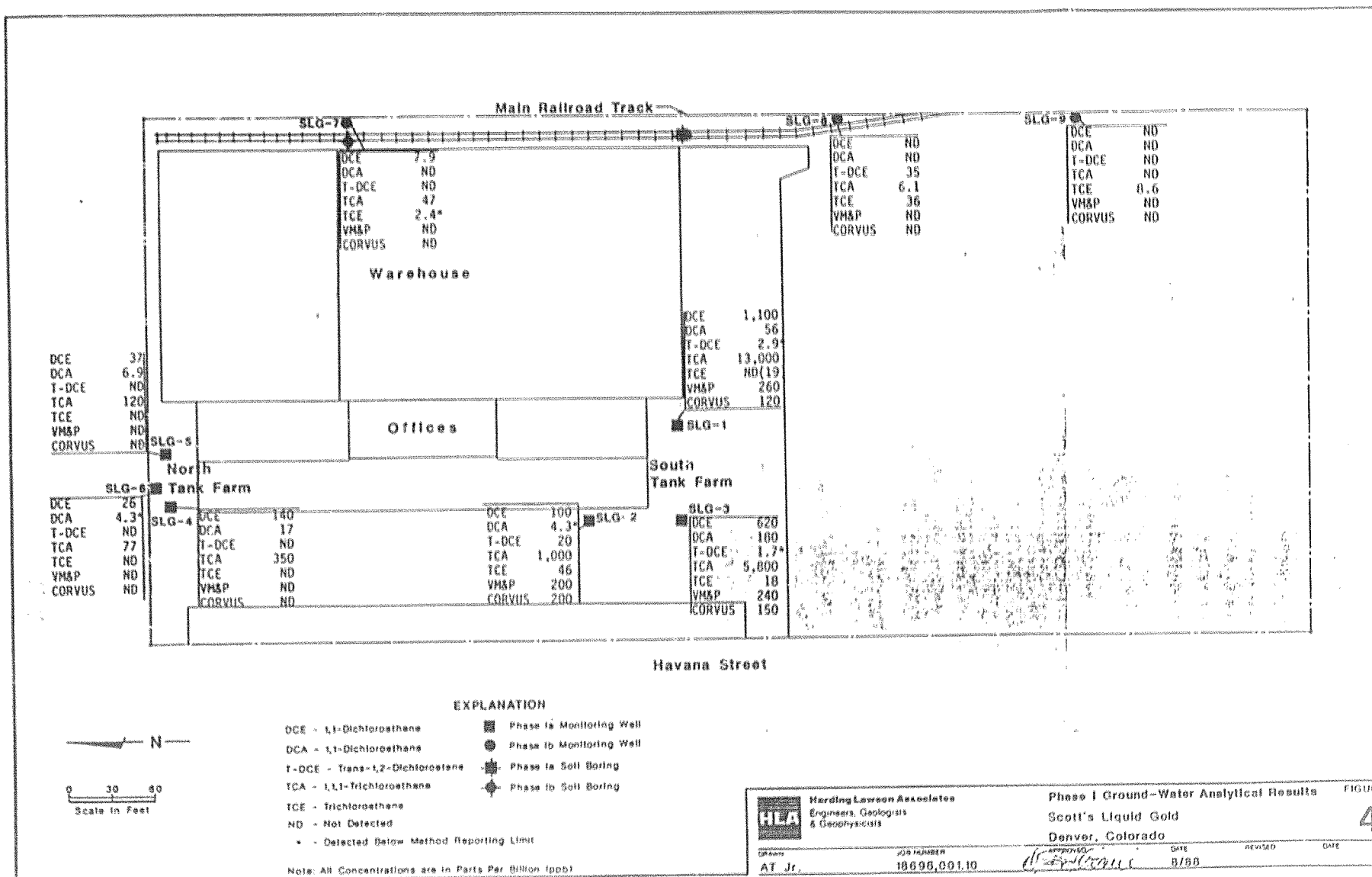
EXPLANATION

- Phase Ia Soil Boring Converted to Monitoring Well
- Phase Ib Monitoring Well
- ✱ Phase Ia Soil Boring
- ⊙ Phase Ib Soil Boring



HWA Harding Lawson Associates Engineers, Geologists & Geophysicists		Phase I Boring and Monitoring Well Locations Scott's Liquid Gold Denver, Colorado		FIGURE
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		REVISED	DATE	





Harding Lawson Associates

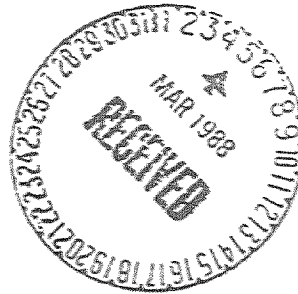
Appendix A

TANK TIGHTNESS TEST RESULTS



WESTERN STATES
TANK TESTING
A division of
Northern Engineering & Testing, Inc.

AFFILIATE
PEI
Tank and Line Testing



February 29, 1988

Harding Lawson Associates
Attn: Dan Balbiani
5580 Havana Street - Suite 5A
Denver, CO 80239

Report for: Scott's Liquid Gold, 4880 Havana Street, Denver, Colorado
WSTT Job No. 88-4004

February 22, 1988, Petro-Tite tank and line tightness tested (1) 2,000 gallon underground unlead tank. Tank tested tight with a $-.021$ GPH (Gallons Per Hour), which meets NFPA established criteria of $\pm .050$ GPH for a tight tank.

Water table below $9\frac{1}{2}'$, water must have entered tank through fill cap with snow piled on it.

Thank you,

Jerry D. Knutson
Manager

JDK:cmh

Enclosures

Data Chart for Tank System Tightness Test

petro title TANK TESTER

PLEASE PRINT

1. OWNER Property <input checked="" type="checkbox"/> Tank(s) <input checked="" type="checkbox"/>	Name <u>Scott's Liquid Gold</u> Address <u>4880 Honoma</u> Telephone <u>San Francisco</u> Name <u>Bill Wildman</u> Address <u>5580 Honoma</u> Telephone <u>San Francisco</u>													
2. OPERATOR	Name _____ Address _____ Telephone _____													
3. REASON FOR TEST (Explain Fully)	<u>Water had entered tank</u>													
4. WHO REQUESTED TEST AND WHEN	Name <u>Dan Ballbani</u> Title <u>Harding Tank Assoc</u> Date _____ Address <u>5580 Honoma</u> City <u>San Francisco</u> State <u>CA</u> Zip <u>94116</u>													
5. WHO IS PAYING FOR THIS TEST?	Company, Agency or Individual <u>Harding Tank Assoc.</u> Person Authorizing <u>Dan Ballbani</u> Title <u>303-375-0180</u> Billing Address _____ City _____ State _____ Zip _____ Attention of: _____ Order No. _____ Other Instructions _____													
6. TANK(S) INVOLVED	Identify by Direction	Capacity	Brand/Supplier	Grade	Approx. Age	Steel/Fiberglass								
	<u>South of Honoma</u>	<u>2000</u>	<u>Tug over</u>	<u>Unlined</u>	<u>?</u>	<u>Steel</u>								
7. INSTALLATION DATA	Location	Cover	Fills	Vents	Siphones	Pumps								
	<u>South of Honoma</u>	<u>Concrete</u>	<u>4" wick</u> <u>manually</u> <u>draw tube</u>	<u>2"</u>	<u>non</u>	<u>Suction</u> <u>top</u>								
8. UNDERGROUND WATER	Depth to the Water table <u>below 117"</u>				Is the water over the tank? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No									
9. FILL-UP ARRANGEMENTS	Tanks to be filled <u>100%</u> Date <u>2-22-88</u> Arranged by <u>Bill Wildman</u> Extra product to "top off" and run TSTT _____ How and who to provide? _____ Consider NO Lead. <u>extra 25 gallon</u> Terminal or other contact for notice or inquiry _____ Company _____ Name _____ Telephone _____													
10. CONTRACTOR, MECHANICS, any other contractor involved	<u>Harding Tank Assoc. - Owner - WSTT - Subcontractor</u> <u>#SC-870907-10</u>													
11. OTHER INFORMATION OR REMARKS	Additional information on any items above. Officials or others to be advised when testing is in progress or completed. Visitors or observers present during test etc.													
12. TEST RESULTS	Tests were made on the above tank systems in accordance with test procedures prescribed for as detailed on attached test charts with results as follows: petro title <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Tank Identification</td> <td style="width: 20%;">Tight</td> <td style="width: 20%;">Leakage Indicated</td> <td style="width: 20%;">Date Tested</td> </tr> <tr> <td><u>South of Honoma</u> <u>Control 2000 gal.</u></td> <td><u>- .0216 PH</u></td> <td></td> <td><u>2-22-88</u></td> </tr> </table> <u>Meets NFPA Criteria of ± .050 Gallons Per Hour</u>						Tank Identification	Tight	Leakage Indicated	Date Tested	<u>South of Honoma</u> <u>Control 2000 gal.</u>	<u>- .0216 PH</u>		<u>2-22-88</u>
Tank Identification	Tight	Leakage Indicated	Date Tested											
<u>South of Honoma</u> <u>Control 2000 gal.</u>	<u>- .0216 PH</u>		<u>2-22-88</u>											
13. CERTIFICATION <u>2-86</u>	This is to certify that these tank systems were tested on the date(s) shown. Those indicated as "Tight" meet the criteria established by the National Fire Protection Association Pamphlet 329. <u>John D. Kuntson Jr., Tank Tester, License # 101</u>													

Petro-Tite
TANK TESTER

HEATH
CONSULTANTS

14. Name of Supplier, Owner or Dealer Scott's Liquid Gold Address No. and Street(s) 4880 City Honolulu State Oahu Date of Test 2-22-88

15. TANK TO TEST
Identify by position Tank near Bioprocess
Brand and Grade Unleaded

16. CAPACITY
Nominal Capacity 2000 Gallons
By most accurate capacity chart available 2005 Gallons
Is there doubt as to True Capacity? ☐
See Section "DETERMINING TANK CAPACITY"

From
☐ Station Chart
☐ Tank Manufacturer's Chart
☐ Company Engineering Data
☒ Charts supplied with Petro-Tite
☐ Other

17. FILL-UP FOR TEST

Stick Water Bottom before Fill-up 5 1/4"
to 5 Gallons

Stick Readings to 1/4 in. Gallons Total Gallons on Reading

FIR UP STICK BEFORE AND AFTER EACH COMPARTMENT DROP OR EACH METERED DELIVERY QUANTITY

Tank Diameter 63.5

Product in full tank (up to fill pipe)

2000
topoff 75
water -5
2005

18. SPECIAL CONDITIONS AND PROCEDURES TO TEST THIS TANK

See manual sections applicable. Check below and record procedure in log (28).

☐ Water in tank ☐ High water table in tank excavation

Elevated 50" to 12" mark
☒ Section line tested with Tare
Line(s) being tested with LVLLY

VAPOR RECOVERY SYSTEM

☐ Stage I
☐ Stage II

19. TANK MEASUREMENTS FOR TSTT ASSEMBLY

Bottom of tank to Grade* 116"
Add 30" for 4" L
Add 24" for 3" L or air seal
Total tubing to assemble Approximate

20. EXTENSION HOSE SETTING

Tank top to grade* 52 1/2"
Extend hose on suction tube 6" or more below tank top

* If Fill pipe extends above grade, use top of fill.

21. TEMPERATURE/VOLUME FACTOR (a) TO TEST THIS TANK

Is Today Warmer? () Colder? () * F Product in Tank * F Fill up Product on Truck * F Expected Change (+ or -)
22. Thermal Sensor reading after circulation 165.53 165.15 04943 36/37 * F
23. Digits per * F in range of expected change 297 digits
24. 2005 \times 0.00063135 = 1.2658567 gallons
total quantity in full tank (16 or 17) coefficient of expansion for involved product volume change in this tank per * F
25. 1.2658567 + 297 = 0.0043
volume change per * F (24) Digits per * F in test Range (23) Volume change per digit. Compute to 4 decimal places. This is test factor (a)

LOG OF TEST PROCEDURES

28. Record details of setting up and running test. (Use full length of line if needed.)

29. Reading No.

30. HYDROSTATIC PRESSURE CONTROL

Standpipe Level in Inches
Beginning of Reading Level to which Restored

31. VOLUME MEASUREMENTS (V) RECORD TO .001 GAL.

32. Product in Graduate
Before Reading After Reading Product Recovered (+)

34. TEMPERATURE COMPENSATION USE FACTOR (a)

35. Thermal Sensor Reading
36. Change Higher + Lower - (c)
37. Computation (c) \times (a) = Expansion + Contraction -

38. NET VOLUME CHANGES EACH READING

Temperature Adjustment
Volume Minus Expansion (+) or Contraction (-)
a 33(V) - a 37(T)

39. ACCUMULATED CHANGE

At High Level record Total End Deflection
At Low Level compute Change per Hour (NTPA criteria)

IT
4
V1

47) arrived at site
15) full tank check for water T.M. not in test - 21.0 7 6 8

11:20	High Level 42"	1	32.4	42	.835	.660	-.175	04943			
11:45	"	2	41.1	42	.660	.630	-.030	982	+39	+1.168	-.343
12:00	"	3	42	42	.630	.630	+0.000	007	+25	+1.108	-.138
12:30	"	4	42.8	42	.630	.660	+0.030	031	+24	+1.103	-.103
12:45	"	5	42.9	42	.660	.695	+0.035	053	+22	+1.095	-.065
1:00	"	6	43.2	42	.695	.745	+0.050	073	+20	+1.086	-.051
1:01	Dropped to low level							091	+18	+1.078	-.028
1:15	Low Level 12"	7									
1:30	"	8	13.2	12	.255	.330	+0.075	108			
1:45	"	9	13.1	12	.330	.395	+0.065	126	+18	+1.078	-.003
1:00	"	10	13.2	12	.395	.460	+0.065	142	+18	+1.078	-.013
1:15	"	11	13	12	.460	.515	+0.055	158	+16	+1.069	-.004
								171	+13	+1.056	-.001

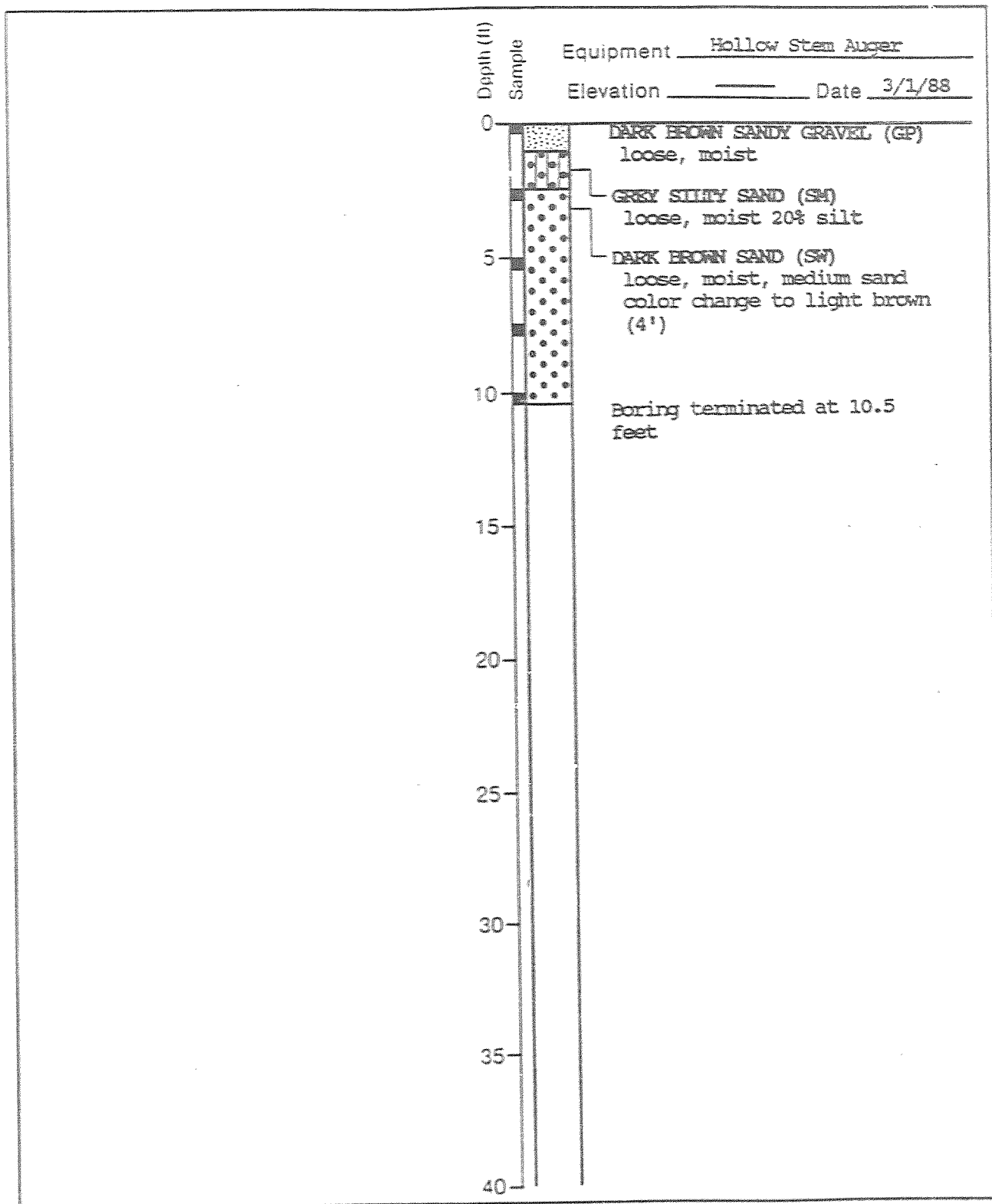
-.021 gal.
Per

System tight.
NFPA established criteria for
a tight tank is $\pm .050$ Gallon
or less.

Harding Lawson Associates

Appendix B

LOGS OF BORINGS AND WELL COMPLETION DIAGRAMS



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Log of Boring EB-1
Scott's Liquid Gold
Denver, Colorado

FIGURE

B1

DRAWN
GG

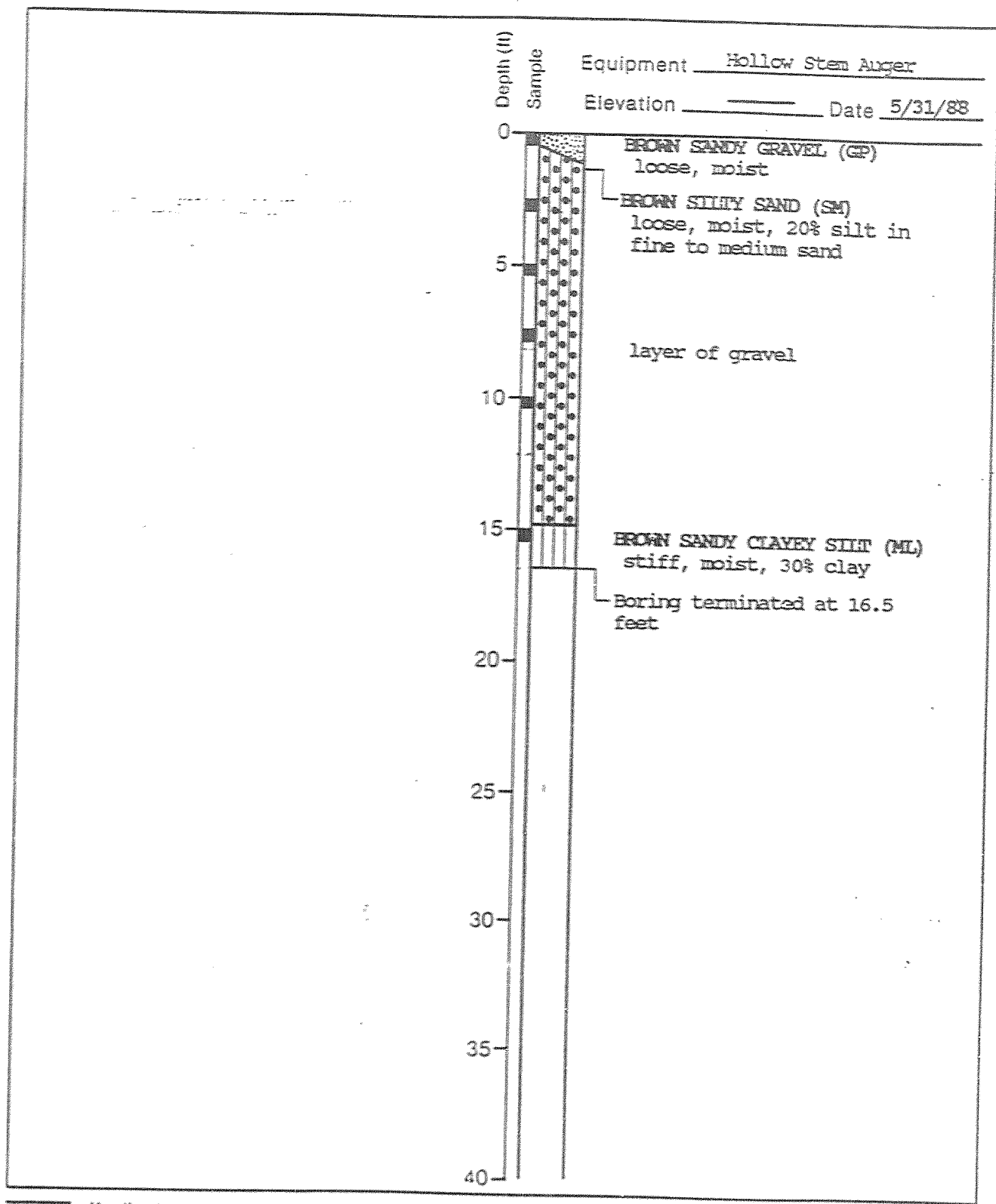
JOB Number
18696.001.10

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[Signature]

DATE
9/88

DATE

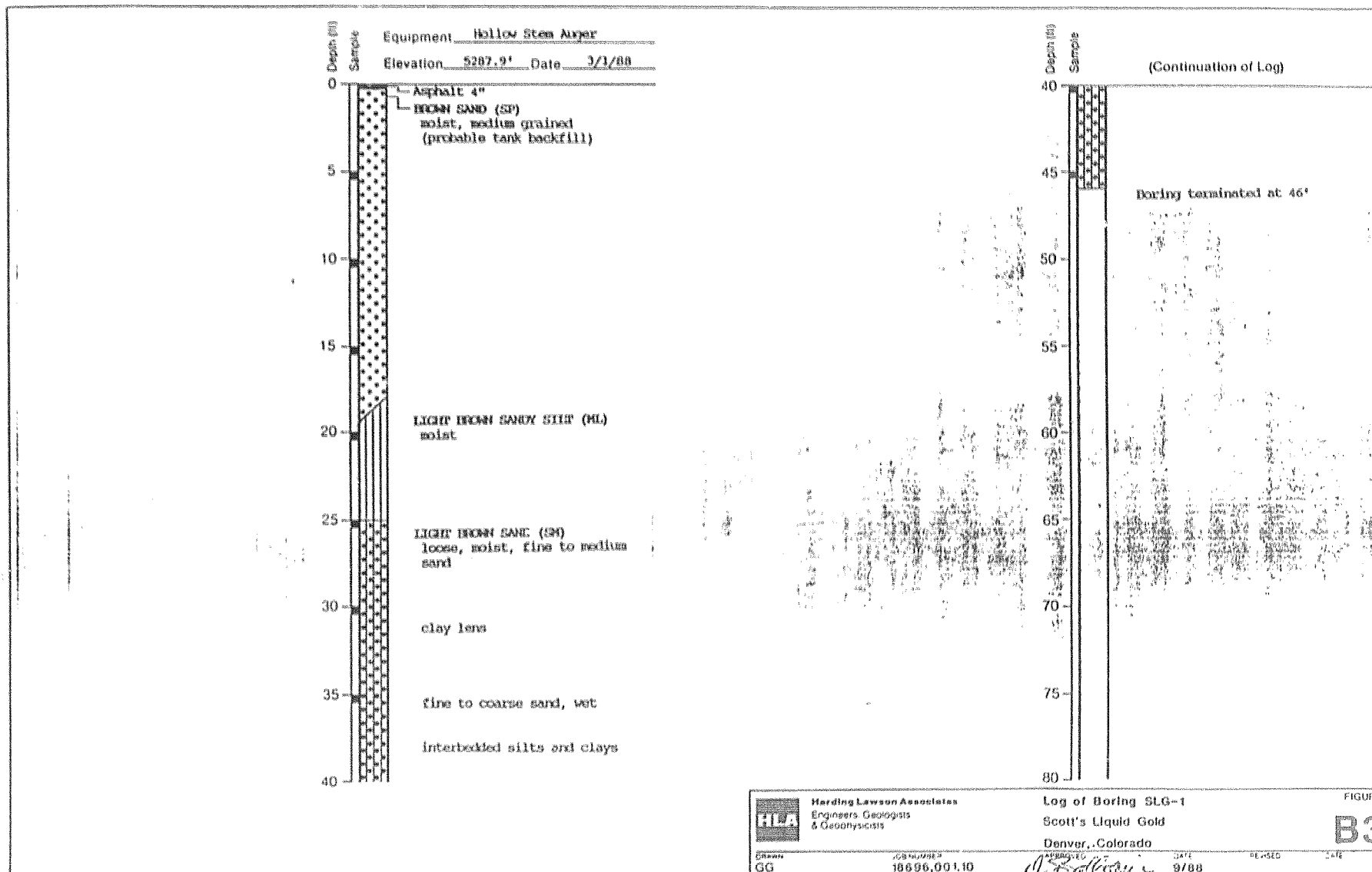
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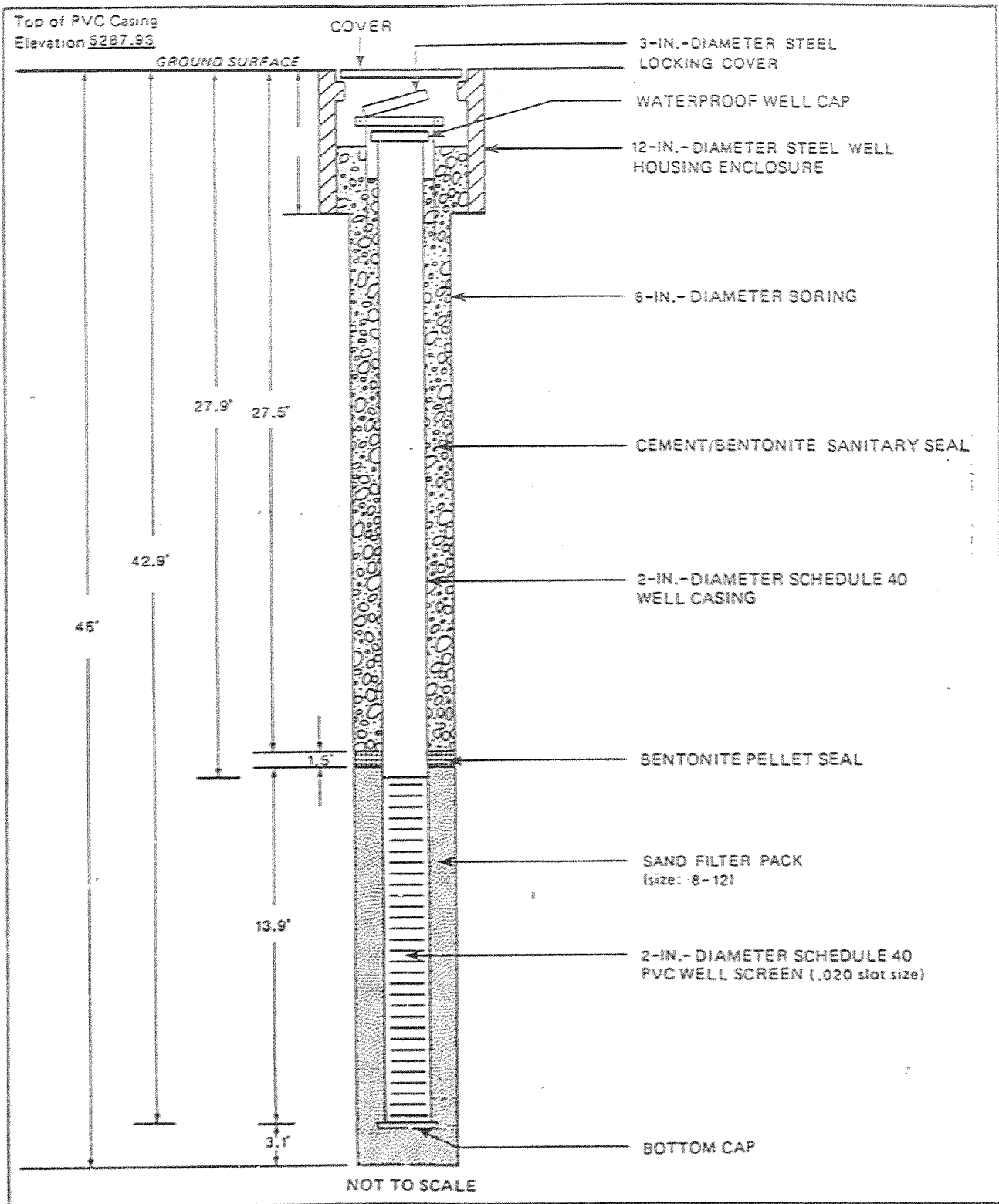


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Log of Boring EB-2
Scott's Liquid Gold

FIGURE
D 2





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& Geophysicists

Well Completion Diagram, SLG-1
Scott's Liquid Gold
Denver, Colorado

FIGURE

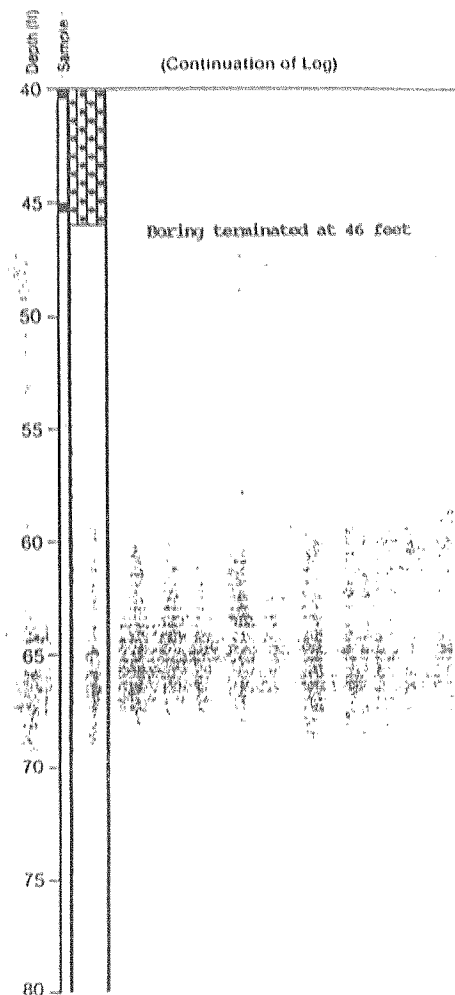
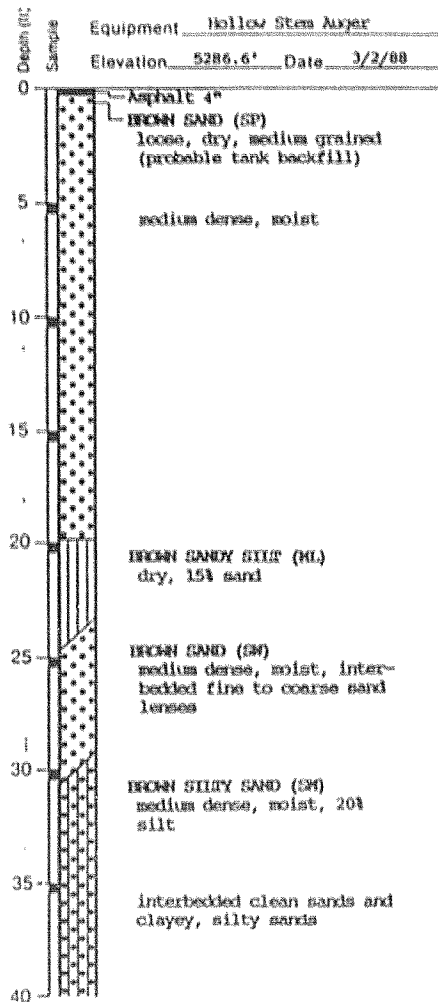
B3a

DRAWN
AT Jr.
FORM GW3

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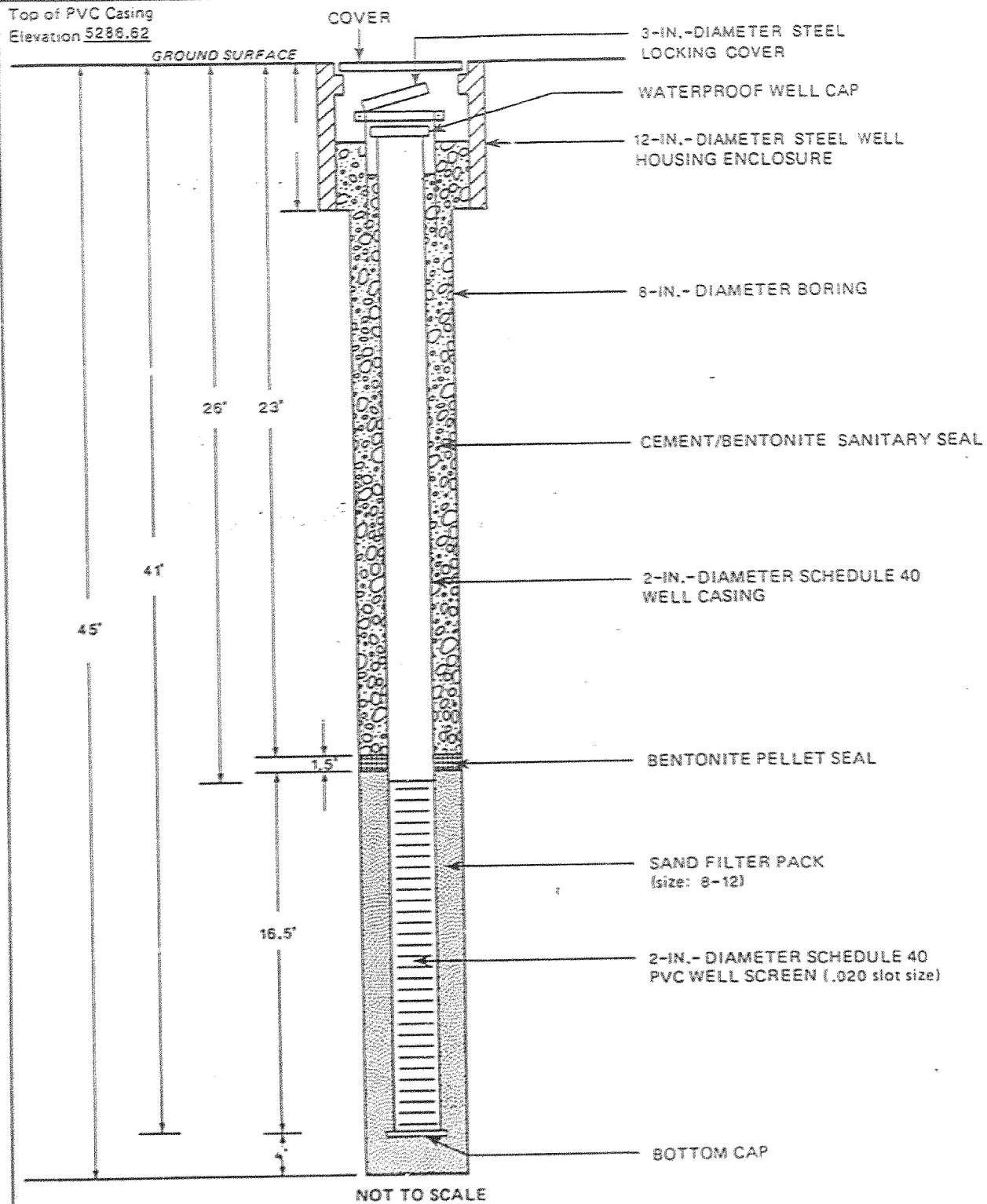
Drawn
 GG

JOB NUMBER
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Log of Boring SLG-2
 Scott's Liquid Gold
 Denver, Colorado

DATE
 9/88

FIGURE
 B4



FIGURE



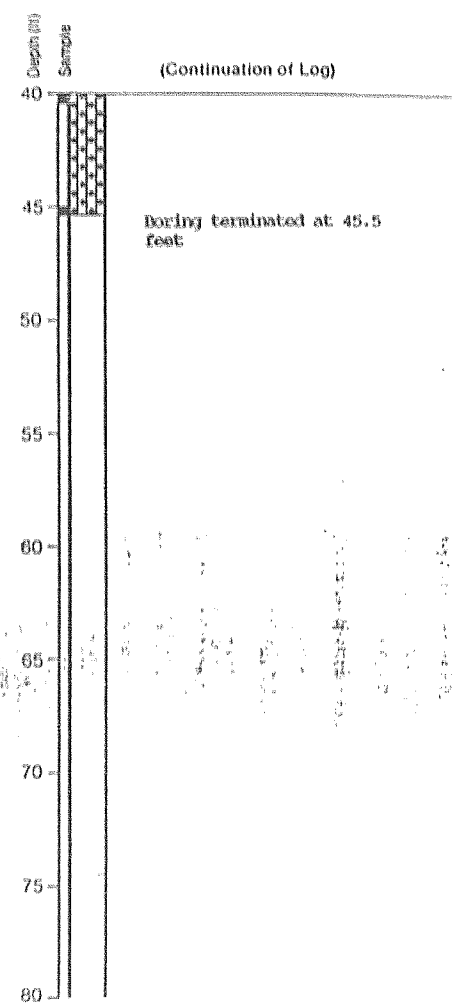
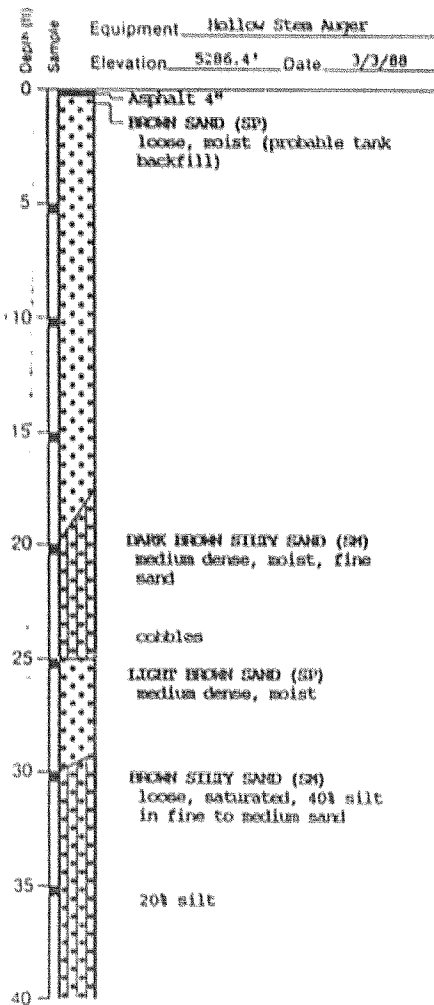
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Engineers Geologists
& Geophysicists

Well Completion Diagram, SLG-2
Scott's Liquid Gold
Denver, Colorado

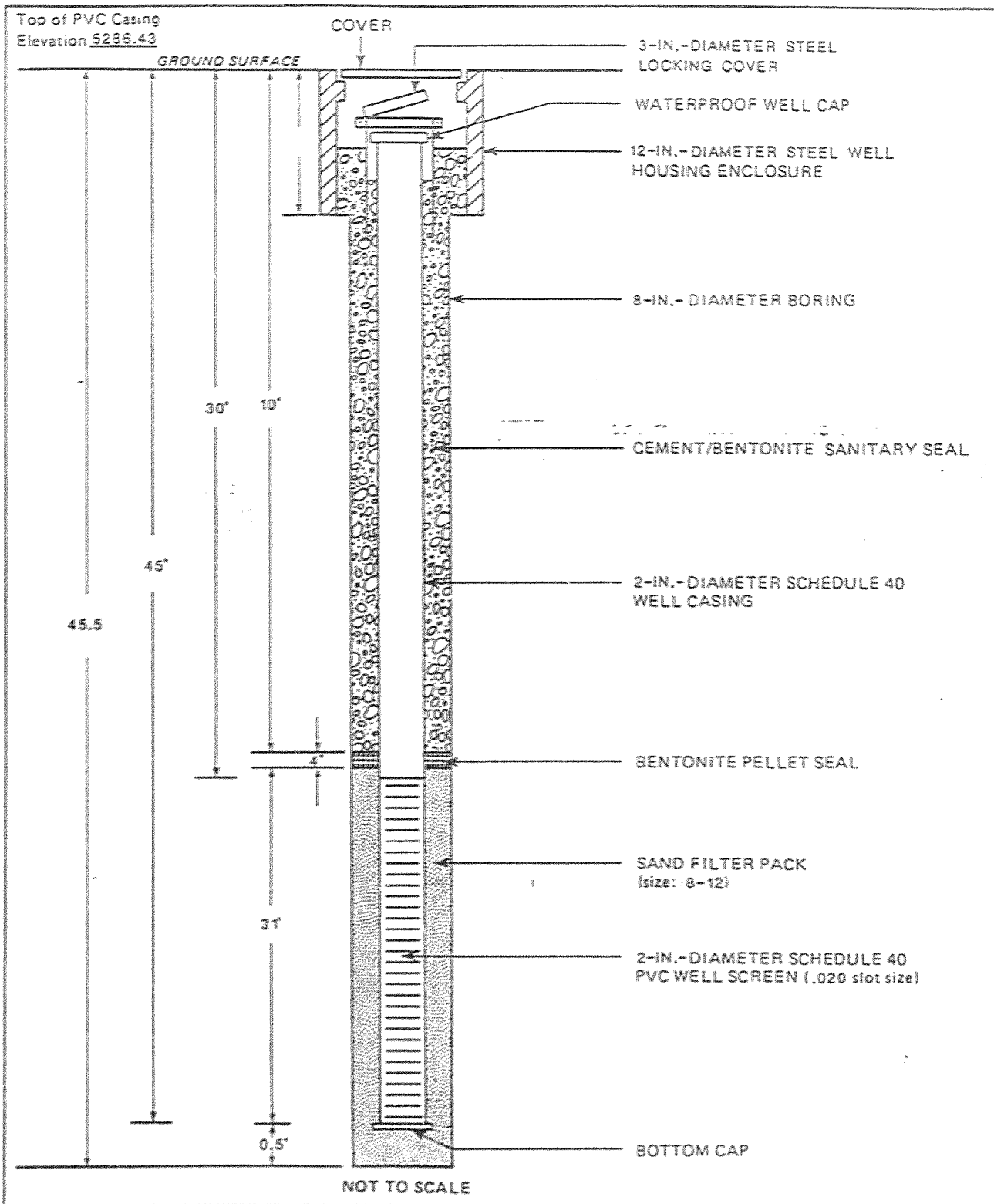
B4a

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AT Jr.	18696.001.10	<i>N. B. Brown</i>	8/88		

FORM GW3



HLA	Harding Lawson Associates	Log of Boring SLG-3		FIGURE
	Engineers Geologists & Geophysicists	Scott's Liquid Gold		B5
Denver, Colorado				
Drawn GG	Job Number 18696,001.10	Checked A. Bolton	Date 9/88	



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& Geophysicists

Well Completion Diagram, SLG-3
Scott's Liquid Gold
Denver, Colorado

FIGURE

B5a

DRAWN

JOB NUMBER

DATE

REVISED

DATE

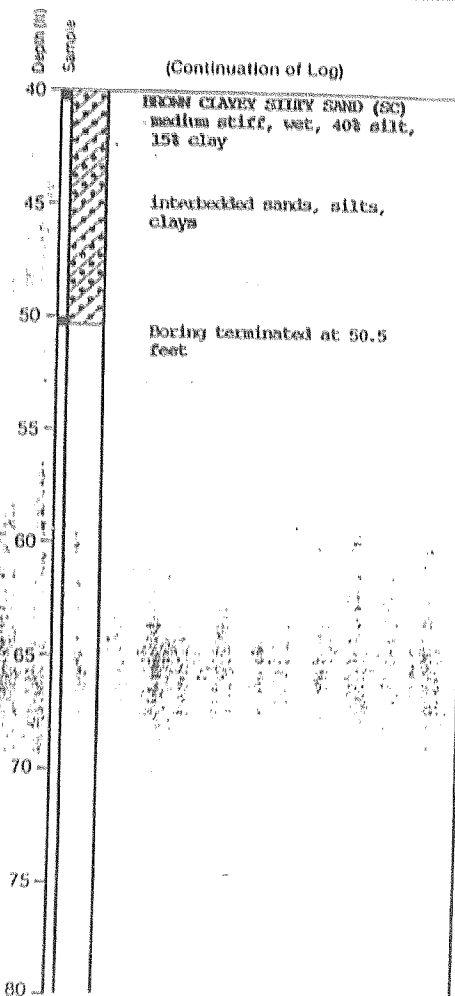
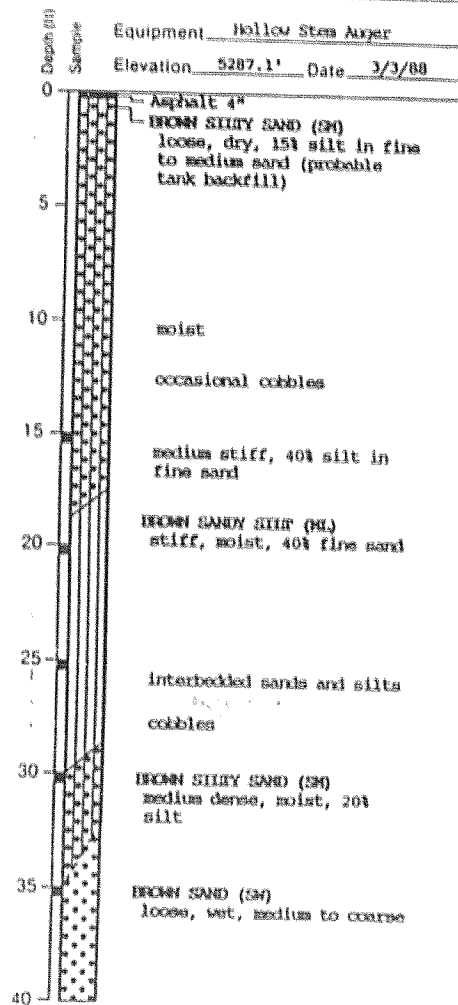
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8/88

FORM GW3



HLA Harding Lawson Associates
 Engineers Geologists
 & Geophysicists

Log of Boring SLG-4
 Scott's Liquid Gold
 Denver, Colorado

FIGURE

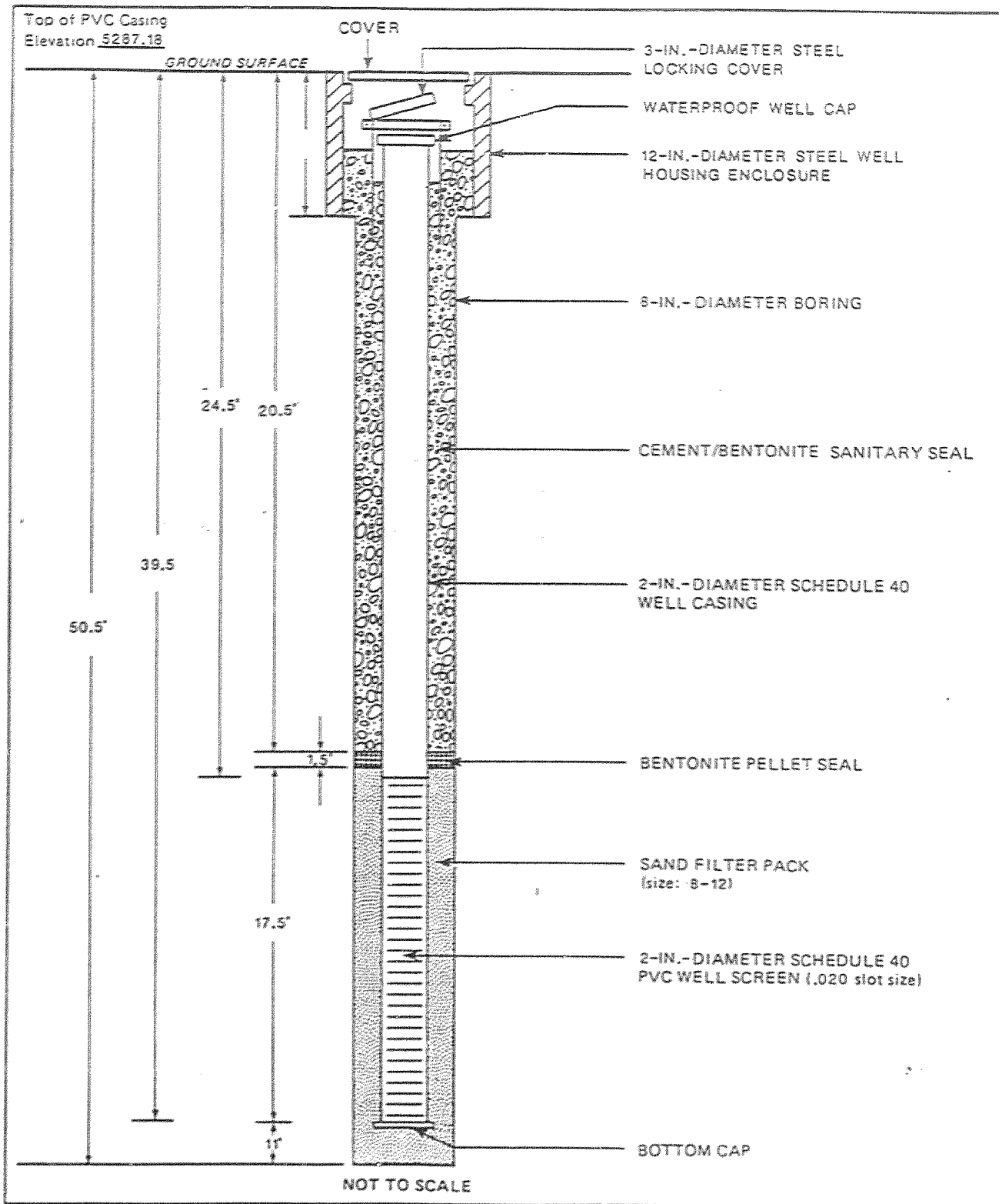
B6

Drawn
 GG

ASR Number
 18696.001.10

By *A. Sullivan*
 DATE 9/88

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Well Completion Diagram, SLG-4
Scott's Liquid Gold
Denver, Colorado

FIGURE

B6a

DRAWN
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FORM GW3

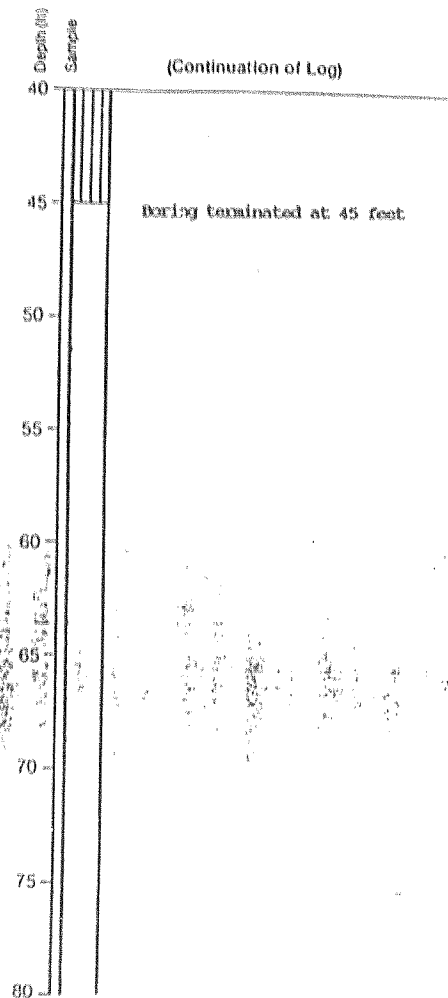
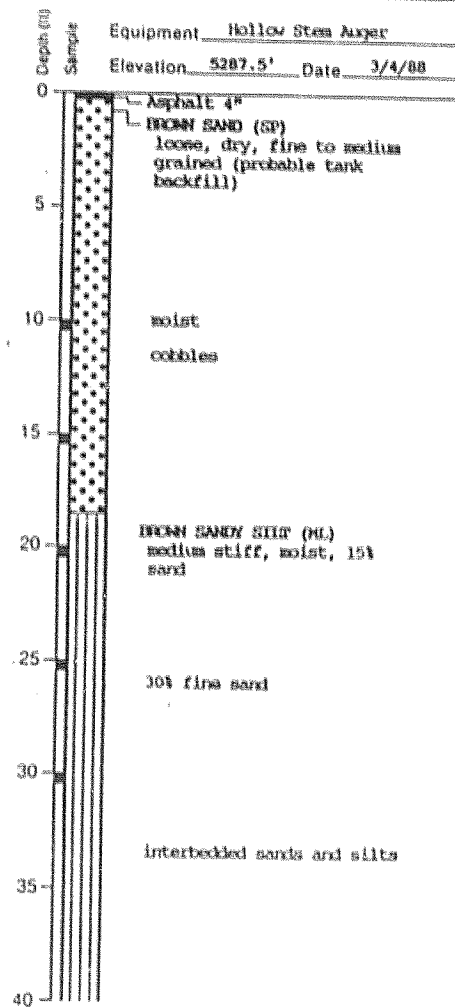
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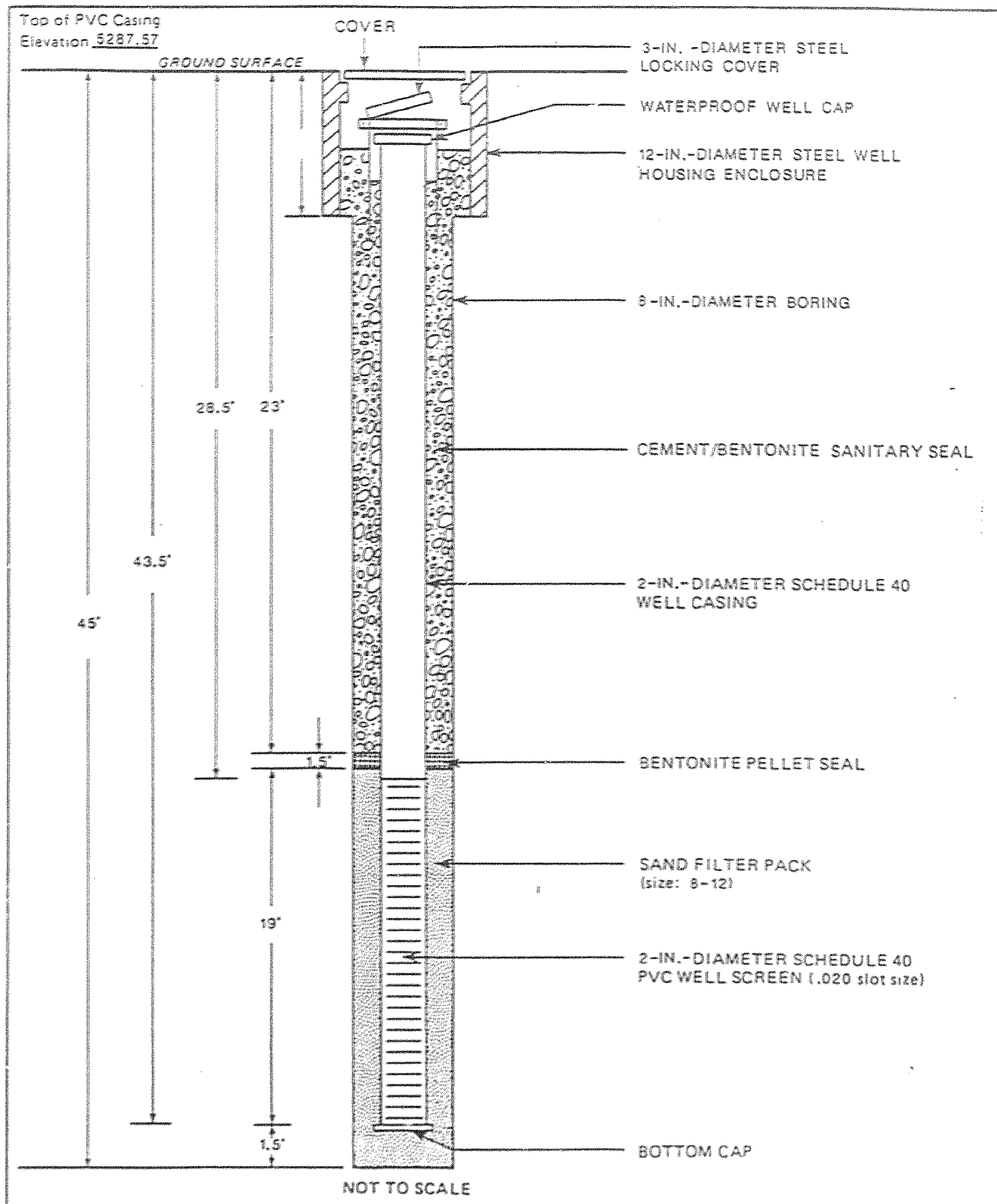
DATE
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DATE



	Harding Lawson Associates Engineers, Geologists & Geophysicists		Log of Boring SLG-5 Scott's Liquid Gold Denver, Colorado		FIGURE B7
	Drawn GG	JOB NUMBER 18696.001.10	APPROVED [Signature]	DATE 9/88	



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Well Completion Diagram, SLG-5
Scott's Liquid Gold
Denver, Colorado

FIGURE

B7a

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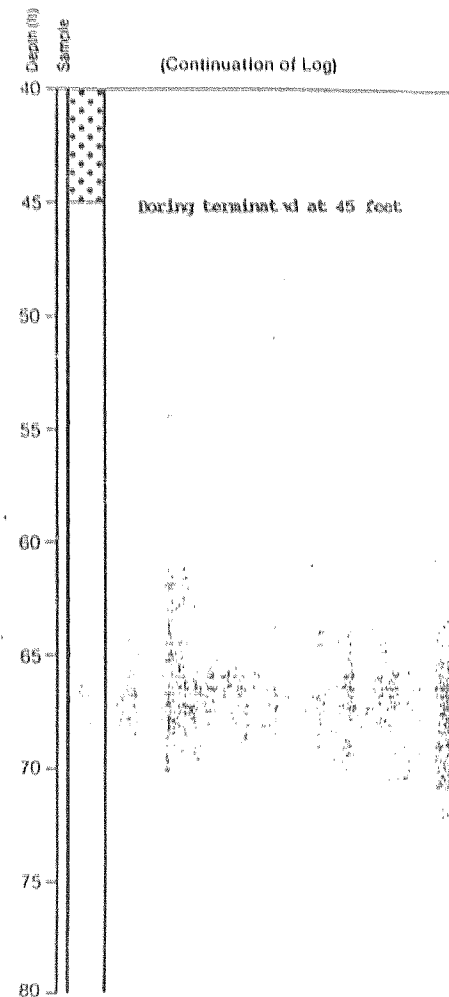
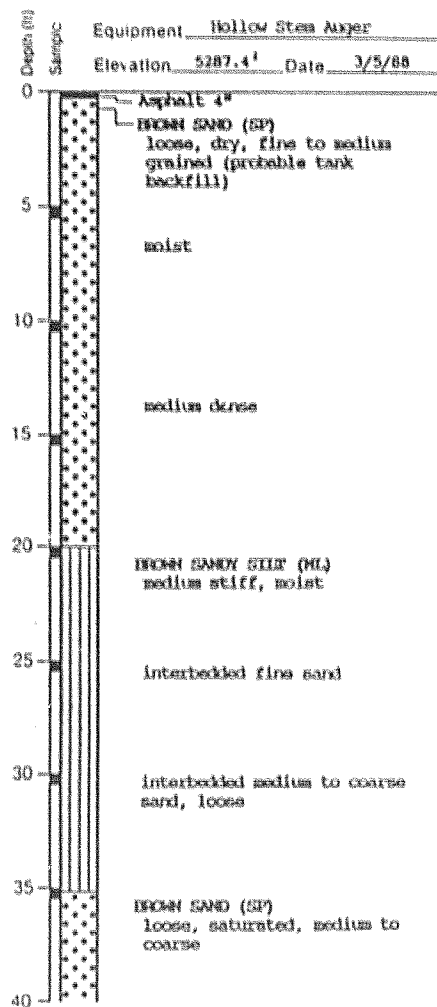
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FORM GW3



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Log of Boring SLG-6
 Scott's Liquid Gold
 Denver, Colorado

FIGURE

B8

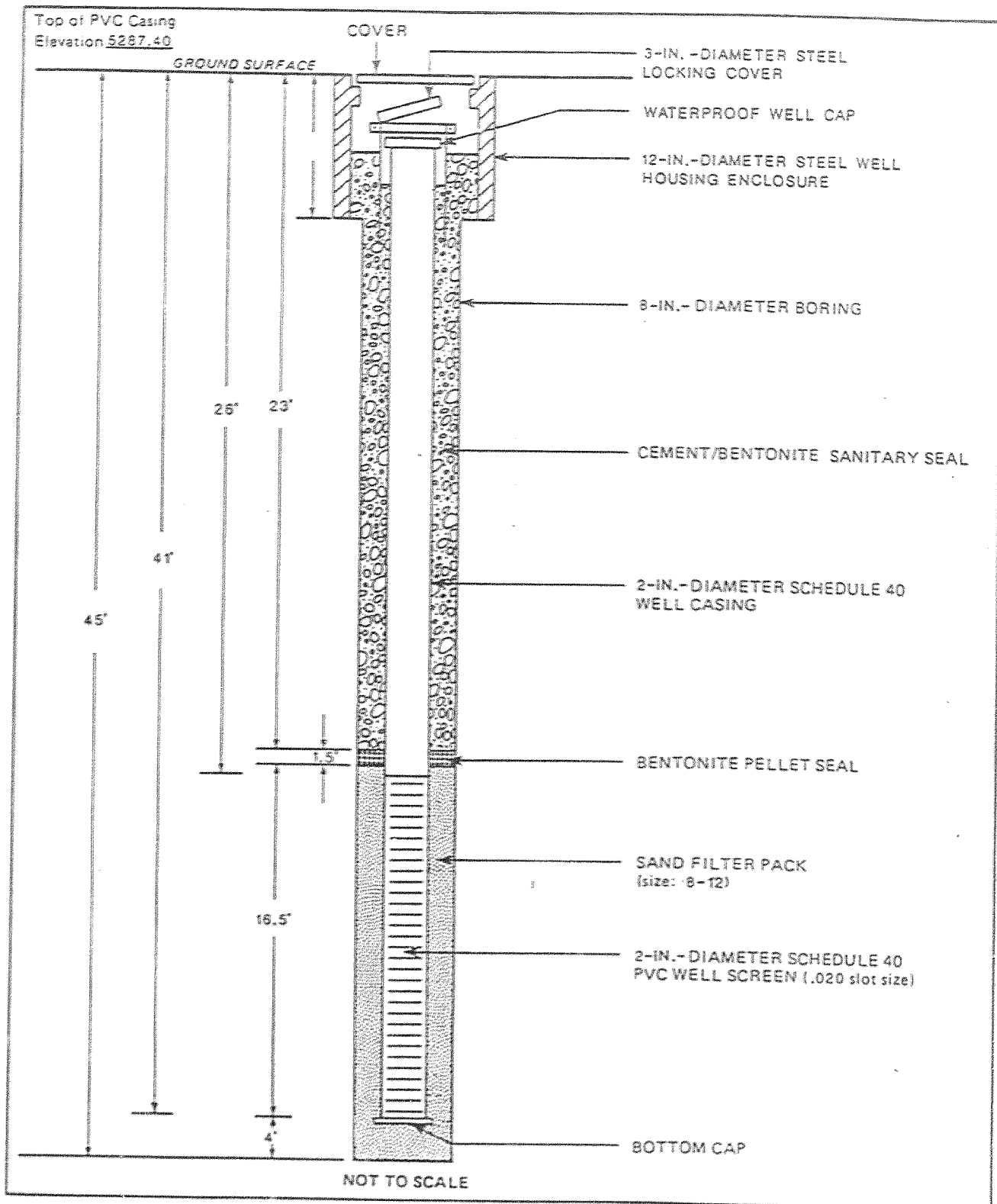
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& Geophysicists

Well Completion Diagram, SLG-6

Scott's Liquid Gold

Denver, Colorado

FIGURE

B8a

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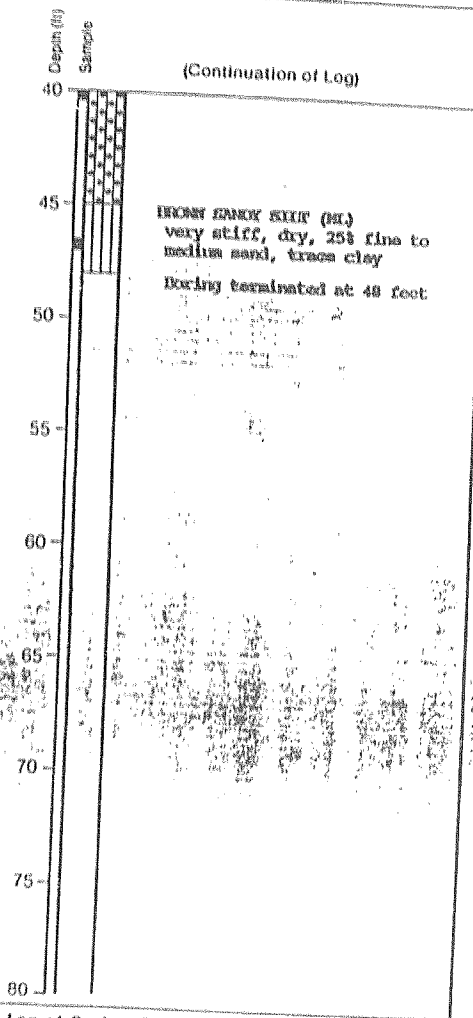
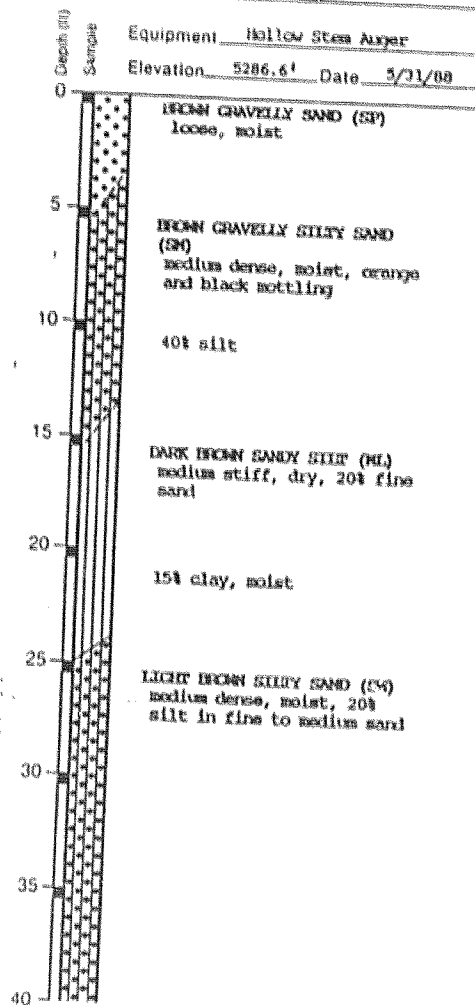
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H. Edwards

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FORM GW3



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Drawn
 GG

PROJECT NUMBER
 18696,001.10

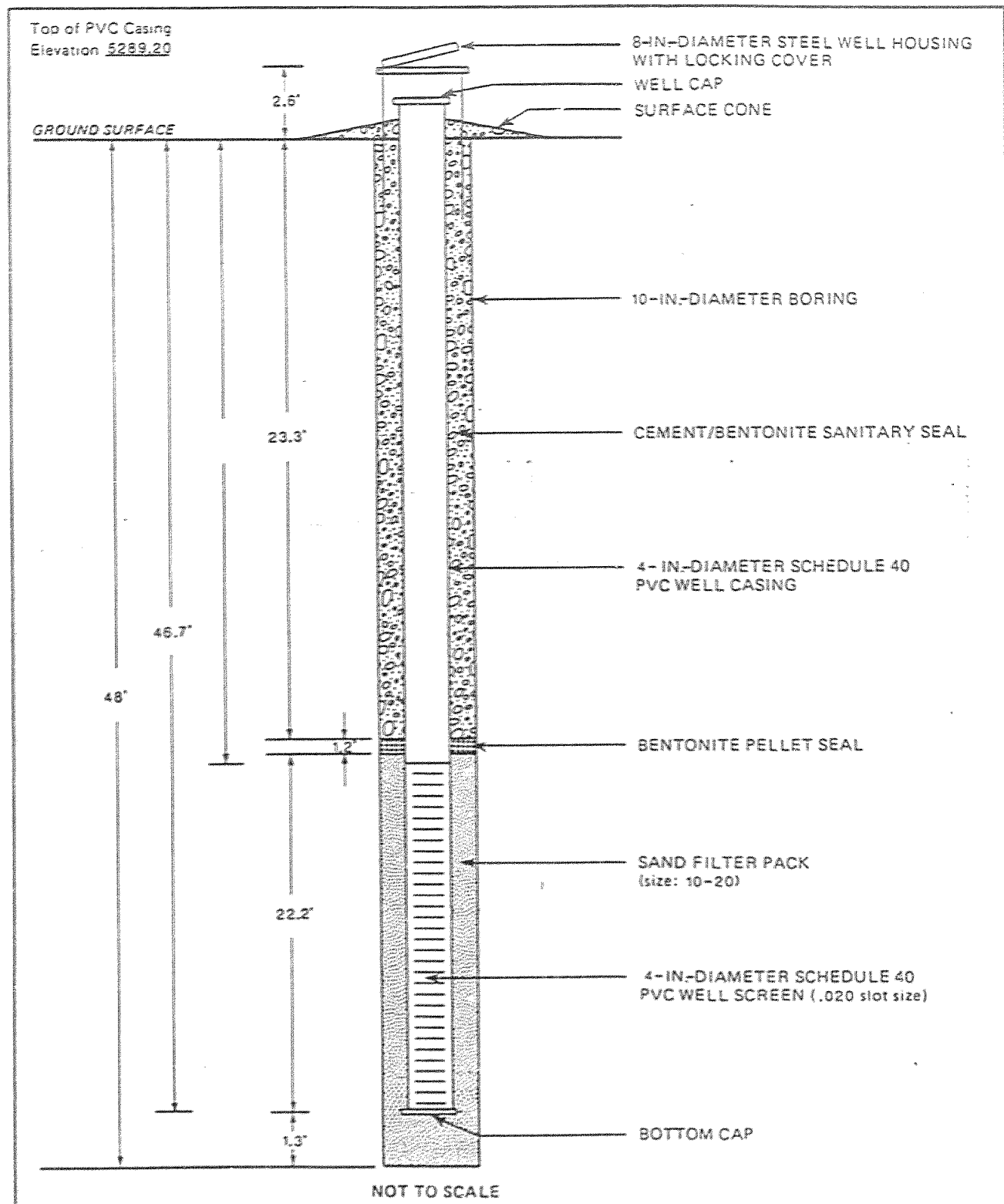
Log of Boring SLG-7
 Scott's Liquid Gold
 Denver, Colorado

DATE
 9/88

DATE
 9/88

FIGURE

B9



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Well Completion Diagram, SLG-7

Scott's Liquid Gold

Denver, Colorado

FIGURE

B9a

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FORM GW1

JOB NUMBER

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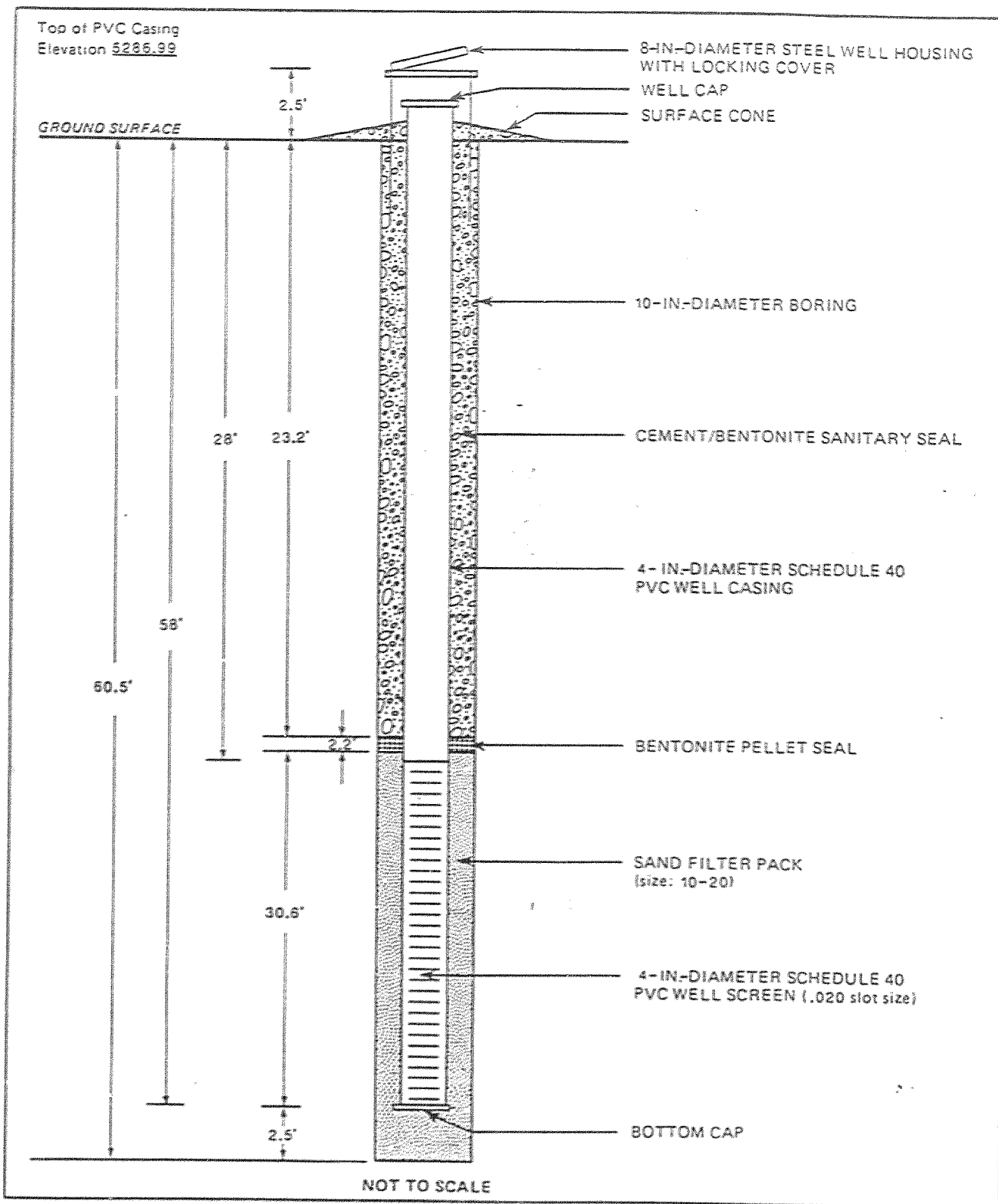
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Well Completion Diagram, SLG-8
Scott's Liquid Gold
Denver, Colorado

FIGURE

B10a

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H. Balmer

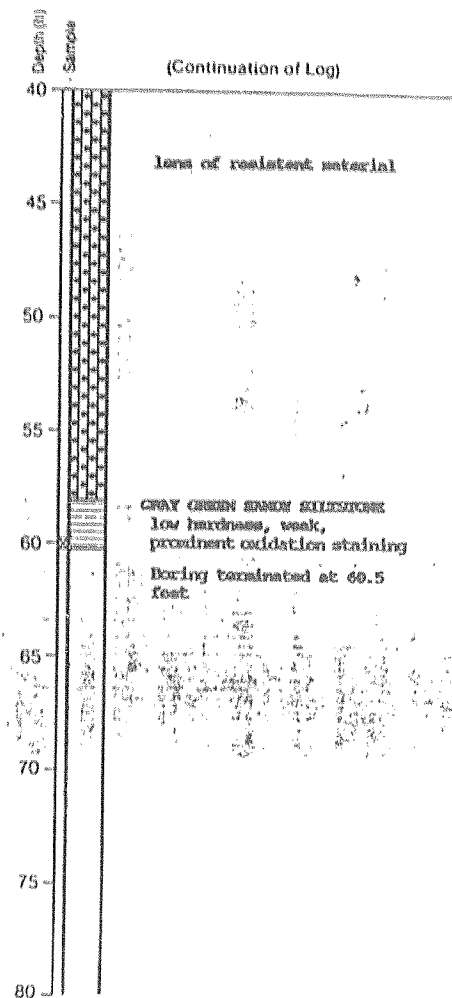
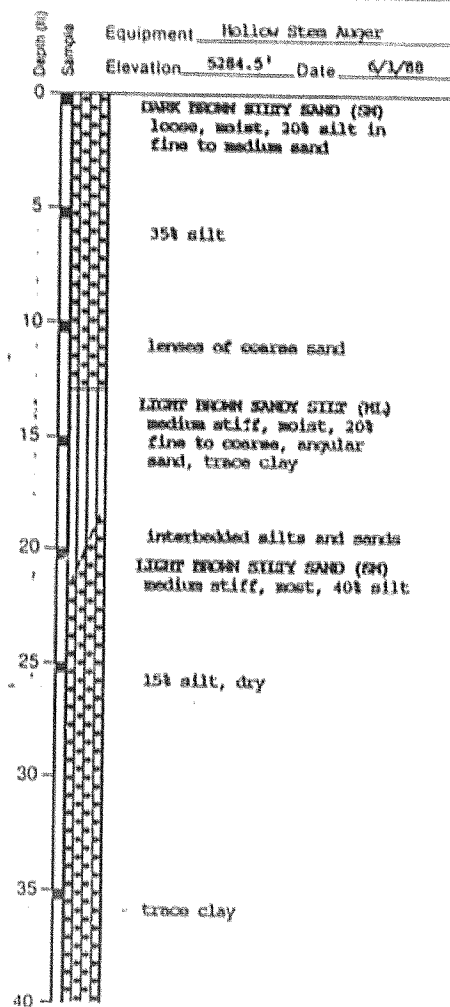
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GRAND
 GG

US FIGURE #
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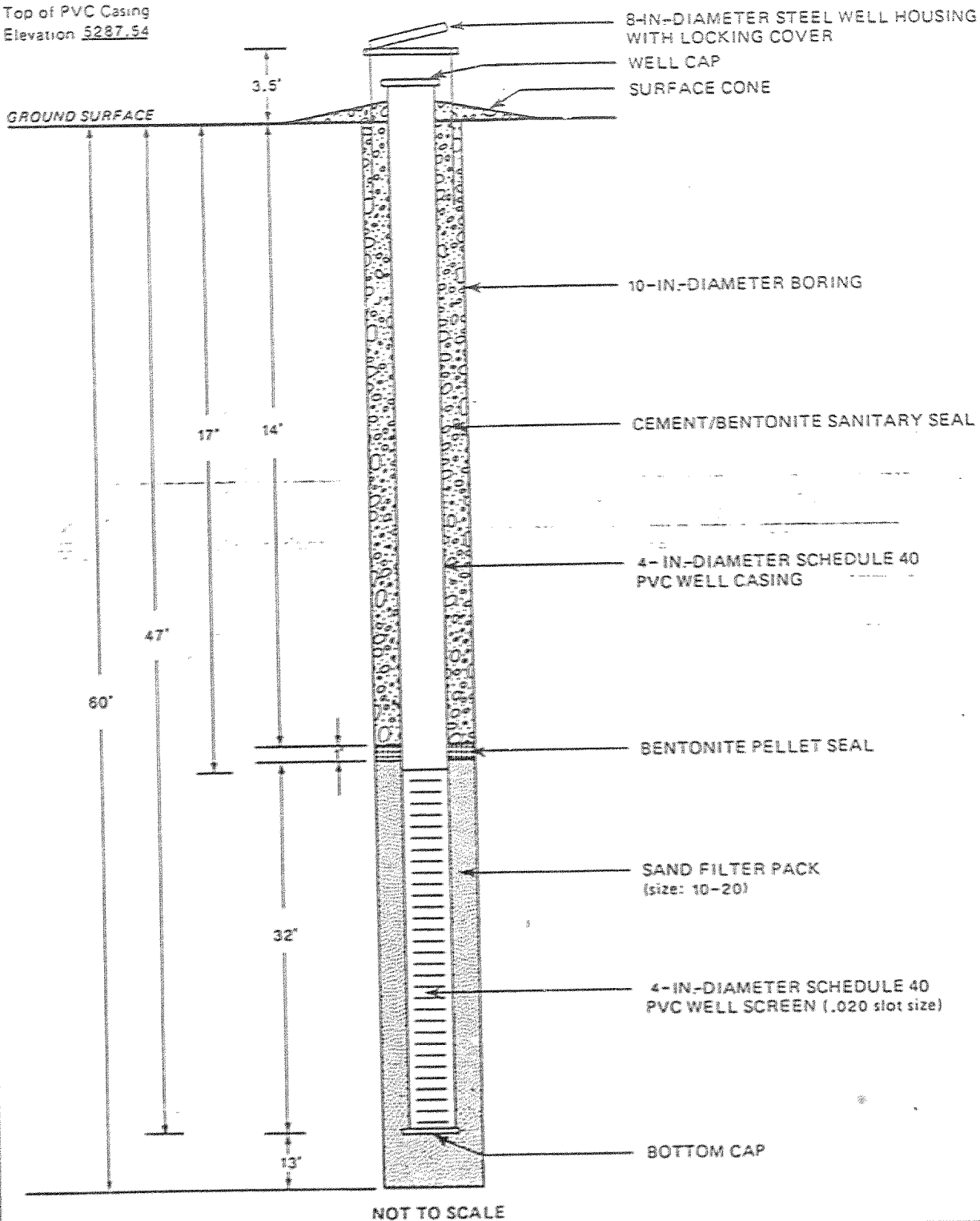
Log of Boring SLG-8
 Scott's Liquid Gold
 Denver, Colorado

FIGURE

B10

DATE 9/88

Top of PVC Casing
Elevation 5287.54



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Well Completion Diagram, SLG-9
Scott's Liquid Gold
Denver, Colorado

FIGURE

B11a

DRAWN

AT Jr.

FORM GW1

JOB NUMBER

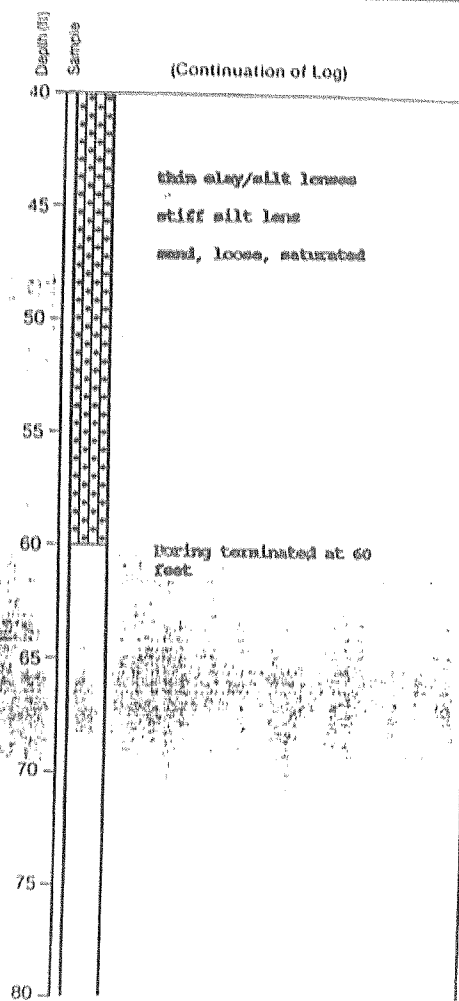
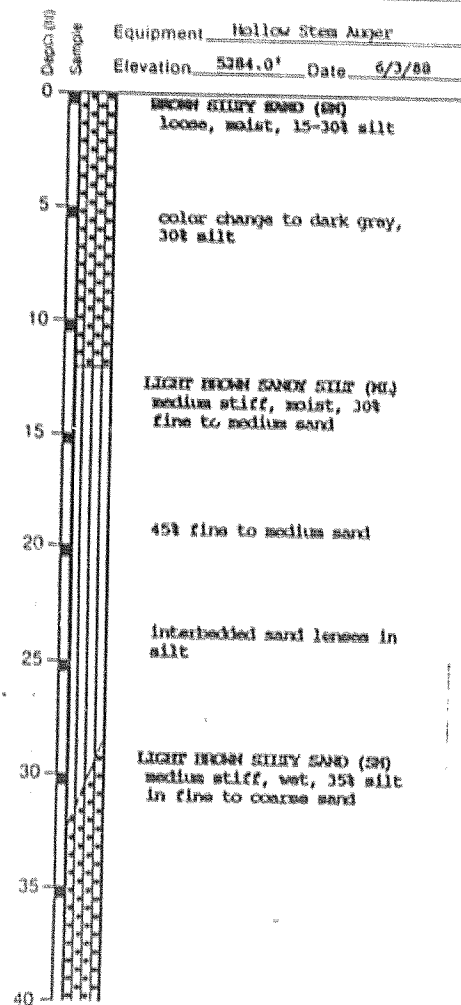
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Log of Boring SGL-9
 Scott's Liquid Gold
 Denver, Colorado















FIGURE

B11

CHART
 GG

JUSTIN ARS
 18896,001.10

DATE
 9/88

MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS	ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS	
		CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS	
		OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%	MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS	
		CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
		OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY	
	HIGHLY ORGANIC SOILS		PI		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION - ASTM D2487-85

Perm	Permeability	Shear Strength (psf)		Confining Pressure	
Consol	Consolidation				
LL	Liquid Limit (%)	TxUU	3200 (2600)	—	Unconsolidated Undrained Triaxial Shear
PI	Plastic Index (%)	(FM) or (SI)		(field moisture or saturated)	
G _s	Specific Gravity	TxCU	3200 (2600)	—	Consolidated Undrained Triaxial Shear
MA	Particle Size Analysis	(P)		(with or without pore pressure measurement)	
■	"Undisturbed" Sample	TxCD	3200 (2600)	—	Consolidated Drained Triaxial Shear
⊗	Bulk or Classification Sample	SSCU	3200 (2600)	—	Simple Shear Consolidated Undrained
		(P)		(with or without pore pressure measurement)	
		SSCD	3200 (2600)	—	Simple Shear Consolidated Drained
		OSCD	2700 (2000)	—	Consolidated Drained Direct Shear
		UC	470	—	Unconfined Compression
		LVS	700	—	Laboratory Vane Shear

KEY TO TEST DATA



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Unified Soil Classification
Scott's Liquid Gold
Denver, Colorado

FIGURE

B12

DRAWN

Job Number

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18696.001.10

U. Bolchini

9/88